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THE PATENT OFFICE GAZETTE.

Several weeks ago we printed a letter protesting in vigorous terms against the recent action of the U. S. Patent Office in curtailing the usefulness of the *Patent Office Gazette* to inventors, and elsewhere we print a number of comments on this letter, the writers with two exceptions being patent attorneys. As will be seen, the ruling criticized does not adversely affect patent attorneys; indeed, by making the *Gazette* even more useless to inventors than in the past, it actually serves their interests; and since all the larger manufacturing companies maintain a patent department with anywhere from one to a half-dozen or more patent attorneys, or their equivalent, on its staff, this factor in the patent situation would appear also not to be affected adversely by the ruling. But the Constitution does not establish a patent monopoly for the benefit of patent attorneys nor even for the profit of manufacturers, except in so far as this profit shall tend to the encouragement of invention intended ultimately for the benefit solely of the public at large. To the extent that the order of a Patent Commissioner limiting the number of claims printed in the *Gazette* reduces the value of the publication to the inventor, it is adverse to the interests of typical American inventors, who vastly outnumber those who are able to call at any moment on patent attorneys for expert advice, or to whom such advice is supplied through employees. While the claims of a patent may not be adequate to give a thorough understanding of an invention—which qualification carries a criticism of the practice permitted in this country with respect to the character of claims—they are of some assistance to those who depend upon the *Patent Office Gazette* alone, and this assistance should not be minimized by suppressing the record therein of all claims but six. Moreover, the ruling to this effect presents a strong temptation towards confining in the future the least possible disclosure of an invention in the first six claims, which practice would bring our patent system still further under suspicion of a large class of inventors who now believe that the system as at present organized can, through manipulation of technicalities, be used for ends never contemplated by the founders. The contention that the *Patent Office Gazette* is of no great value to inventors even if all the claims of a patent are printed therein is in itself a reflection on the Patent Office, not only with respect to the allowed phraseology of claims, as noted previously, but also because—contrary to practice abroad—of the omission of the classification data which would enable an inventor to select and order, without the intervention of a patent attorney, the patent specifications as issued belonging to the sub-class in which his work lies.

The ruling to which this refers is still another instance of the working of bureaucratic economy at the expense of inventors, which, during the past generation, has so strongly characterized the Patent Office. At one time the entries in the

Patent Office Gazette included a brief of the specifications preceding the claims—which is still the practice in most foreign countries—but this was discontinued about 25 years ago. Formerly a bulletin issued from time to time by the Patent Office contained the patent classification, from which an inventor could learn the number of patents issued in the class in which he was interested, and thus be enabled to determine whether he could afford to purchase the entire class; for several years past this classification has been absent from the bulletin. No general index of patents has been printed for a quarter of a century, and although the material for such an index has been compiled, it has not been printed for the stated reason of the great expense that would be entailed. Finally, the classification in the Patent Office has been placed in a more or less chaotic condition by the great advance in inventive activity since the date of last revision, and while a new classification has been authorized and Congress at one time enlarged the Patent Office force in order to enable this classification to be completed, the date when this will be done is entirely indefinite, and, in fact, at the rate of progress in the past, may be a generation distant—the cause of delay being that the force which should have been engaged on the work has been diverted to other duties in the office. In short, notwithstanding that the Patent Office is not only entirely supported from the fees of inventors but yearly turns into the Treasury a large profit from its operations, its policy has consistently been one of economy at the expense of the interests of the inventor. Invention in this country is already sufficiently discouraged by the inevitable litigation with its enormous expense necessary to secure to the inventor the fruits of his thought and labor, without a further handicap being added in order that the monetary profit which a government department derives from him shall not be reduced.

Temperature Rise of Active Conductors.

The most familiar fact connected with the existence of an electric current in a wire is that the wire becomes heated. Our incandescent lamps and our fuses utilize this universal principle, so that the fact is not totally regrettable. We would much prefer that our switches, rheostats, house-wiring and cables did not become heated by the currents, but if the property did not exist, our incandescent lighting business would vanish at the same time. Although the heating of conductors by currents is so manifestly and manifoldly presented to our senses, yet the laws controlling the temperature rise under different conditions are complex. The conductor gets hotter and hotter until in the final state the flow of heat from its surface into surrounding space balances the internal generation of heat by the current. As the escape of heat from the conductor's surface takes place, in general, by thermal conduction, by fluid convection and by radiation, the amount of temperature elevation which is necessary to determine the required rate of escape depends intimately upon the environment of the conductor; that is, as to whether it is covered thickly with cotton or merely supported in free air, is motionless or rapidly moving, immersed in running water or encased in piping.

If a conductor did not change in resistance with temperature the rate of generation of heat by the current would be directly proportional to the square of the current. Again, if the thermal conducting power of the conductor's environment remained constant for all temperature elevations met with in practice, the final rise of temperature would be strictly proportional to the rate of heat generation, and, under the conditions assumed, to the square of the current. In other words, if the resistance of the conductor kept constant, and the thermal resistance in the path of the escaping heat remained constant, doubling the current would mean quadrupling the temperature elevation of the conductor in the steady state. The assumptions are not absolutely correct because the conductor offers more electric resistance as it gets hotter, and produces more heat than in proportion to the simple current squared. A thin conductor in air, moreover, does not behave in regard to radiation as though its external thermal resistance were constant. The thermal resistance of radiation comes down as the temperature elevation increases. However, to a first approximation, we may neglect these deviating circumstances and consider that doubling the steady direct-current strength through a conductor quadruples, for practical purposes, its ultimate steady temperature elevation. This means that if we plot temperatures against currents on logarithm paper, or paper ruled not evenly, but to the uneven gradations of the engineer's slide rule, the graph will be a straight line, inclined to the horizontal at an angle of 63° 26′, whose tangent is 2.

The article by Mr. C. C. Badeau, appearing on page 95 of this number, embodies this plan in a convenient graphical form. By reference to the diagram in the paper the final temperature elevation of a conductor can be approximately predicted along a straight line for different currents, when its final temperature elevation with any one given steady current is known. It was shown in a paper by Dr. Kennelly and Mr. E. R. Shepard, read before the American Institute of Electrical Engineers last June, that for copper wires cooled by conduction the straight lines on logarithm paper are a little steeper than those given in Mr. Badeau's paper; *i. e.*, that they lie more nearly at an inclination of 65° 33′, if the temperature elevation does not exceed 50° C., and steeper yet, or more nearly at 66° 30′, if the temperature elevations approach, but do not exceed 100° C. This extra inclination of the straight lines is attributable to the heating up of the copper and its consequent increase in resistance. For many practical purposes this refinement is unnecessary, and the diagram of Mr. Badeau, which is very easily reproduced, may be employed conveniently.

Another Single-Phase Road.

We are interested to note the completion of still another electric road using single-phase motors, this time just over the Canadian border. In spite of various adverse influences the compensated series motor is making steady progress and must be reckoned with in every new interurban road. It has, in fact, succeeded to an extent that is notable considering the adverse conditions under which it began its career. There was little genuine enthusiasm for the system in its early stages, and it was pretty consistently damned with faint praise.

While most single-phase roads are of rather recent construction, there is strong evidence of satisfactory results, in that there has been offered no general criticism of any particular source of trouble, indicating that the serious difficulties have been pretty well eliminated. The road before us is a type of

the cases in which single-phase traction has done well—a fairly high-speed interurban line with a moderately powerful equipment, unhampered by complicated direct-current connections and free to develop its own territory in its own way. The total length is, including an extension now under way, 37 miles, and the service includes passengers, express and freight. The motor cars, each equipped with a pair of 100-hp motors, are big enough to haul trailers when necessary, and the service is typical of the modern interurban line. We are glad to note that the working pressure is 6600 volts throughout, the city of Windsor, the chief terminal, having very sensibly agreed to the use of this voltage within its limits. With the first-class catenary construction used in this case, and when the entrance route is reasonably clear of obstruction, there seems no valid reason for objecting to 6600 volts as against the 1100 which had been discussed. Either is equally safe if well installed, or dangerous if badly installed, and the higher voltage is practically about as easy to insulate securely as the lower. With the catenary construction the number of points of support is reduced to a minimum and adequate insulators are obtainable without the slightest difficulty. It is found, too, that there is no trouble in executing repairs on a trolley wire at this voltage by the aid of a platform mounted on the same kind of insulators that carry the line. A somewhat unusual feature of construction is the use within the city of Windsor of concrete trolley poles.

The line is operated from a single power station located on the shore of Lake Erie where water for condensation is pumped. The plant at present consists of two 500-kw units, single-phase, stationary armature machines, directly coupled to cross-compound, Corliss type engines running at the somewhat unusual speed of 125 r. p. m. The periodicity is 25 cycles and the armatures are so connected that they give both 6600 and 13,200 volts at the switchboard, the former for use indirectly on the trolley wire, the latter for transmission to distant parts of the system as required—at present to but a single reducing station. One of the two banks of water-tube boilers is now being equipped for firing with natural gas, which is fortunately available, and the second bank may be similarly fitted later. For an interurban road of this character the single-phase system certainly has much to recommend it, especially in cost of construction and in simplicity of operation as regards motive power. It would be exceedingly interesting in this instance to know just how the cost of equipment compares with what would have been required had the line been laid out with the more usual combination of transmission to sub-stations with synchronous converters, and working a conductor at 600 volts. Of course, in the case of the Windsor, Essex & Lake Shore road the length of line favors strongly the alternating-current system, and the small number of motor cars reduced the extra expense of alternating-current motors; but, on the other hand, it is this very condition that is the reason for being of the alternating-current system. One cannot always deal with short lines and heavy traffic. The relative maintenance of direct-current and alternating-current equipments is as yet uncertain from lack of data. One would naturally expect in using alternating current more repairs on the cars and less on the rest of the system than with direct current. Yet strong claims are made for the endurance of the alternating-current motors—claims which necessarily take time to substantiate since it is not the first year or two of operation that measures the depreciation of car equipments.

THE TELEPHONE.

It is but a few years ago that the whole art of telephony was developing by such leaps that it was not uncommon for methods and apparatus to be superseded almost upon installation—"grown old over night" as it were. To-day we find quite a different state of affairs. Indeed it is doubtful if one can point to a single change introduced during the past year which may be termed radical, and yet there is probably to-day as much thought and energy expended upon the perfection of the art as at any time in its history. So long as a discovery inspires investigation from purely scientific motives, development is apt to reflect originality of thought. When, however, a discovery attains a strong commercial status, commercial considerations largely influence the trend of technical development. To illustrate with respect to telephony, at first the discoveries were made almost entirely by scientific men. Then coincident with a great wave of popular interest came the inventive period, during which inventions followed each other in an almost continuous stream. Nothing was too trivial nor too radical to receive inventive consideration, and patents were obtained for the slightest details. The interests in commercial control fostered and encouraged invention from any source. Competition instituted a great wave of duplication, and almost everything already invented had consequently to be reproduced in one form or another. We now come to the present day when the whole technical development is controlled from the purely commercial side, and when the inventor must prove his invention to be immediately commercial in order to obtain consideration. It is also a period of development for inventions cast aside in the great desire for something new. In short, the present period is one of technical economy, when technical developments must show a saving with respect to operating expense or annual charges.

At present we find in the wire plant a more extended use of cable, both underground and aerial. For distributions to subscribers' premises great attention is given to devices for economically running wires, both for individual stations and for large groups. In the same department we note the beginning of concrete pole construction as represented by a few experimental installations. In toll-line work there is an increasing interest in duplexing, if it may be so called. The possibility of this was shown years ago by Mr. Frank Jacobs, but it is only within a recent period that duplexing has been finding its way into practical and extensive use. At the subscriber's station there is a better designed instrument. Accessibility of parts and wiring are now matters of prime importance. The sets are smaller and more compact, and often not a single wire is exposed to view to tempt the user. At the central office there is a general tendency toward standardization of parts and circuits, the switchboards, however, growing rather more complicated. This last, however, is due to economy through reducing the operator's work. Labor for operating is a very considerable item in the cost of giving service, and fractional savings in the work per connection soon aggregate a handsome total. Because of this every traffic man is recommending means for relieving the operators of responsibility. Automatic ringing is practically standard for trunk working, and it seems but a question of a short time when all ringing will be automatic in large installations. The extensive use of a separate jack for each station of a party line is a step in this direction. With this arrangement all stations are numbered alike, and in so far as the operator is concerned, all are rung alike, the operator thus

being relieved of all distinctions of code. The use of the service meter, where charging is on the message basis, is still another economy, rendering it possible to attain with a momentary pressure of the finger the equivalent of the written memorandum of a few years ago. These are typical of the kind of technical development we may expect for the next few years. Of course there may be some startling and unforeseen developments. The now much talked of wireless telephone may even make its impression. Again, there may be a great stride in the automatic or semi-automatic field at any time. However, the greater part of effort will probably continue to be expended on improvements along the line of greater economy with respect to existing installations.

Electrotechnical Progress During the Year 1907.

The year which has just passed has revealed no epoch-making electromagnetic discoveries, perhaps, but has witnessed substantial advances in electromagnetic applied science. In the science of electromagnetics, there has been a steady development of the electronic theory. Not only have physical researches further developed this theory, but the outlines of the electronic theory have been spread among practical men. As an indication of the latter condition, the presidential address before the American Institute of Electrical Engineers last year was entitled "The Properties of Electrons." Side by side with the advance of the electronic theory has gone the study of radioactivity. The doctrine of the transmutation of substances under the influence of radium emanation has received further experimental support, and the idea of the permanence of elements has steadily lost ground. The recourse to the conservation of energy is, however, all the more earnest. To the extreme school of electronists, matter is but a localized evidence of intense activity, the forms of which may be transitional. The sum total of energy in the known material universe is believed to be constant, although the sums total of the various elementary substances are not necessarily constant.

In regard to experimental electromagnetics, a prominent achievement concluded last year has been a redetermination of the velocity ratio between the electrostatic and electromagnetic units, by the Bureau of Standards at Washington. As already reported in our columns, this ratio for free space is given as 299,710 kilometers per second, obtained by balancing a periodically intermittent charging current in a condenser against a steady current from the same electromotive force, through a known resistance. This velocity is, therefore, very nearly one-tenth of one per cent less than 300,000 kilometers per second in free space, as against 299,860 kilometers per second, the best accepted free-space velocity of retina-stimulating light, from the measurements of Michelson, Newcomb, Perrotin and Weinberg. These two outstanding velocities are thus separated by one part in 2000, a discrepancy for future experimenters either to eliminate or to explain. The knowledge of electromagnetic waves and their properties has been perceptibly developed during the past year, both experimentally and mathematically, by reason of researches in wireless telegraphy. This most useful daughter of electromagnetic-wave science has now grown sufficiently strong to contribute to the welfare and progress of the mother subject.

The technical progress of wireless telegraphy has caused additional labor to be directed to the precise computation of inductances and capacities. Several new formulas for the precise computation of inductances of coils, or the capacities of condensers, have been published last year. Instead of confining our knowledge to the case of a relatively long coil, the inductance of any coil whose winding is cylindrical may now be computed. The range of practicable wireless telegraphy has been extended until it reaches across the Atlantic Ocean. Moreover, methods of inducing and maintaining forced vibration of wireless-telegraph antennas have come into application. These bid fair ultimately to replace the free-vibration methods of spark telegraphy, with their rapid damping and short wave-trains. Wireless telephony has also markedly increased its range during the year, from only a mile or two, up to a hundred miles or more; although such long ranges are not as yet in ordinary use. Wire telegraphy has made distinct progress during the year in the direction of high-speed automatic long-distance type-printers. Wireless telegraphy has publicly entered into competition with submarine-cable telegraphy across the Atlantic Ocean; but with as yet no recognized effect on the submarine traffic.

In the technology of electrical engineering, a noteworthy event of 1907 was the publication of a revised and enlarged edition of the standardization rules of the American Institute of Electrical Engineers. The rapid growth of electrical engineering caused the preceding edition of these rules to be out of date, and behind the best practice, in various directions. Perhaps the most rapid development of technology has been in the direction of controlling and measuring high voltages. The technology of electric lamps, lighting and illumination has advanced steadily. The advance has been made both from the experimental and from the engineering sides. At least one new and seemingly practical suggestion has been put forward, looking towards a new and improved primary standard of light. This is the more urgently needed, because of all commercially distributed commodities, lighting is still far the most inefficient and technically the least definitely measurable. No better primary standard of light than a flame, either of pentane, colza-oil, or amyl-acetate, has yet been satisfactorily produced.

A noteworthy event in last year's electrotechnical chronology has been the death of Lord Kelvin, the British pioneer of applied electricity. Prior to his work, electrical measurement was in a primitively chaotic state, and electrical units hardly existed. Contemporaneously with his work, and greatly aided thereby, electrical measurement and electrical units have come into universal use all over the world, the electrical units of all countries being the same. Lord Kelvin has been buried, within the last few days, in Westminster Abbey, at the request of the Royal Society. The previously most recent interment of a scientist in Westminster was that of Darwin 25 years ago.

Electrochemistry in 1907.

While scarcely any of the commercial electrochemical developments of 1907 can be called revolutionary, the steady evolution of the industry has proceeded along correct and logical lines and in a way which opens the brightest prospects for the future. The application of the electric furnace to the metallurgy of iron and steel has occupied the foreground, and the chief commercial development, at least in this country, has been the extension of its use in the manufacture of ferro-alloys.

This is a logical development, for the reason that the manufacture of ferro-alloys involves the reduction of highly refractory oxides, like silica, titanic oxide, etc., in which the high temperature required can be obtained conveniently and economically only in the electric furnace. The earliest commercial developments began in Europe, following the collapse of the calcium-carbide boom. The erection of calcium-carbide furnace plants had been over encouraged by the large European manufacturers of electrical machinery, and when the price of carbide as a consequence dropped to an unprofitable point, it became necessary to use the furnaces for some other purpose, and many were converted into ferro-alloys plants. To indicate the industrial importance of this industry, it may be noted that a single French company—that using a Girod process—which started with a small experimental plant of 28 horse-power in 1898, employs now a total of 18,000 horse-power in three plants, while water-power developments now in course will bring up the total to some 45,000 horse-power. Almost all of the plants for the manufacture of ferro-alloys are hydro-electric, the low cost of energy from which is of special importance in the manufacture of ferro-silicon, since, owing to the cheapness of the raw materials, power is the chief item in the cost sheet. Most of the ferro-silicon in the past has been imported from Europe, while American manufacturers, owing to the higher prices for power, directed their attention first to the manufacture of ferro-alloys other than fero-silicon. The past year has, however, witnessed the establishment of the ferro-silicon industry in this country. The pioneer ferro-chrome plant in the South has undertaken the manufacture of ferro-silicon intermittently with ferro-chrome, in order to keep the plant uniformly loaded without overproduction of ferro-chrome. In California ferro-silicon is now being made in a plant which ultimately is to be employed for making pig iron. Finally, a new Canadian works has been established near Niagara Falls, where it is claimed that power can be secured more cheaply than at Niagara Falls itself, and where ferro-silicon is made successfully on a considerable scale. Otherwise American ferro-alloy manufacturers have paid special attention to the production of ferro-alloys free from carbon, which command a high price and in whose production the power cost is of less importance.

While quite a number of electric steel plants have been erected during the past year in Europe, progress along this line in this country has not been rapid. Two processes are chiefly used, employing respectively the induction furnace and the Heroult furnace. In both cases the object is simply to refine ordinary steel, and in order to save power, the steel is fed from the open-hearth furnace or from the converter into the electric furnace in molten state. The metallurgical procedure of the Heroult process has become well defined and almost standardized. In this, the open-hearth process is carried further than is usual, the object being to reduce the content of prosphorous in the open hearth to the desired amount. Naturally the carbon is simultaneously reduced and the metal highly oxidized. This molten peroxidized metal is then introduced into the electric furnace, in which, by the successive formation of proper slags, the sulphur is removed, the metal de-oxidized and also re-carburized to the desired hardness. There can be no doubt that with the electric furnace it is possible to control the chemical composition of a steel more thoroughly and more economically than in any other metallurgical apparatus. Finally, an unique plant now in course of erection at California for the production of pig iron in the Heroult electric furnace, should be mentioned. The conditions which make this plant unique are availability of extensive iron deposits, comparatively cheap electric power and cheap charcoal. This first commercial electric pig-iron plant will thus not compete in reality with the blast furnace since in the absence there of cheap coke, blast-furnace operation would be impossible.

Another electrochemical development around which much interest has centered during the past year is the fixation of atmospheric nitrogen, which for some time past has been successfully carried out in Norway. It will be remembered that in the Birkeland-Eyde process which is used there, the nitrogen and oxygen of the air are forced into combination by means of the electric arc; but in order to handle a large quantity of air and treat each particle of air no longer than necessary, the arc is deviated by means of a magnetic field in a manner to form a flaming disc, the air being passed through the disc in a direction perpendicular to it. It is interesting to note that Moscicki, in Switzerland, previously known for his experiments with high-frequency, high-tension discharges, is now working along the same lines with a somewhat different apparatus. The commercial success of this process in Norway is largely dependent on the low cost of power at the plant, which is stated to be somewhere about $4 or $5 per hp-year. Since the raw material costs nothing, the power is here also a decisive factor for economical success and this explains clearly why no attempts have been made to employ this process, for instance, at Niagara Falls with a price for power four or five times higher. The other method of fixation of atmospheric nitrogen, in which nitrogen is caused to react with calcium-carbide to produce calcium-cyanamide, appears to be making good progress in Europe, and it is proposed to erect in this country a cyanamide plant in the South for the supply of this material as a fertilizer. Cyanamide may either be used direct as a fertilizer, or worked up into other chemical products like cyanide, etc.

With respect to other established electrochemical industries, a steady progress may be recorded. The large electrolytic copper refineries near New York City have greatly extended their plants. Some patents issued during the past year have directed attention to a new phosphorus works in Pennsylvania producing phosphorus in the electric furnace from wavellite (aluminum phosphate). The electric production of chlorine and caustic has further assisted the paper industry, diaphragm processes being chiefly used. The Niagara works using the Townsend cell have now been in operation almost two years, with apparently satisfactory results. The two most interesting developments during the last year in other branches of electrochemistry were probably Mr. E. G. Acheson's method of making deflocculated graphite and Dr. Henry Noel Potter's work on silicon-monoxide. Deflocculated graphite introduces the artificial-graphite industry into the lubricating field and "monox" (the trade name for silicon monoxide) is useful for making paints and inks, while a screen coated with monox powder is claimed to be impervious to fine solid particles and to all sorts of germs and organisms. These two examples show in an interesting way how electrochemical development reacts on other industries and in unexpected ways.

Wireless Telegraphy on the Great Lakes.

The extent to which wireless telegraphy is being used on the Great Lakes will be appreciated when it is known that nearly 70,000 messages were handled during the season of 1907 for marine interests by the Clark Wireless Telegraph System.

When the season opened, early in March, there were only two stations in operation, one at Detroit, Mich., and the other at Cleveland, Ohio. Early in the month of May a station was placed in operation at Port Huron, Mich. In August a fourth station was placed in operation, at Buffalo, N. Y., and in September a fifth station was placed in operation, at Toledo, Ohio. The five stations brought Buffalo, N. Y., Cleveland, Ohio, Toledo, Ohio, Detroit, Mich., and Port Huron, Mich., into wireless communication.

With the opening of navigation, the Clark Wireless Telegraph Company began the work of soliciting the telegraph business of the bulk-freight handlers from many of the large marine interests on the Great Lakes. These interests combined represent some 320 fleets and over 1000 vessels. The telegraph work consisted in reporting boat passages, orders, etc., from Port Huron and Detroit to the owners' and managers' offices in Cleveland, Toledo and Buffalo, and in receiving in reply messages and orders for the captains of the boats, as to the destination for the vessel to go with her cargo, also furnishing the Cleveland office with all the up and down passages at Port Huron station—these were transmitted twice daily. The passages up to 8 o'clock in the morning were sent in at 8:30 a. m., and the passages up to 1:30 in the afternoon were sent in at 2:30 p. m. The vessel owners were thus able to formulate the destination orders before the vessels reached Detroit.

In many instances the vessel orders and destination orders were given for the vessel on passing at Detroit, and the destination changed again before the vessel passed the Lime Kiln Crossing. In many instances this could not have been accomplished by wire telegraph or even long-distance telephone. The Cleveland station operator and Detroit station operator transmitted and delivered some of these rush message orders in less than three minutes. It is stated that the stations were operated for the entire season without serious delays.

State Regulation of Water Powers.

In connection with the extension of the privileges of the Hudson River Electric Power Company, already noted in these pages, a concurring opinion has been filed by Commissioner Osborne, dealing more particularly with the question of general development of the water power resources of the state, and the precautions to be observed by the Public Service Commission in granting water-power privileges to private corporations. As a general proposition, Mr. Osborne sets forth that it is the duty of this commission, if it be possible, so to act that if the state should decide to follow along the lines indicated by the Governor's message, and the newly established water supply commission, no action on the part of the Public Service Commission should put the state in a less advantageous position than it would have been if this commission had not acted.

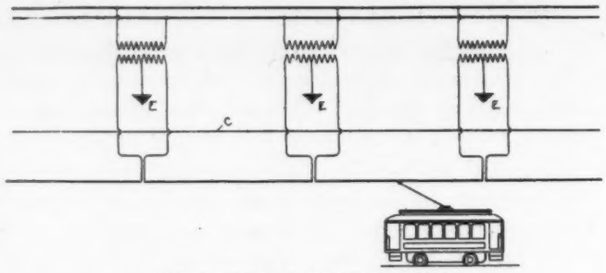
Commissioner Osborne, after calling attention to the clause in the annual message of Governor Hughes, relative to the placing of undeveloped water powers under state control and the establishment of the state water supply commission as a result of these suggestions, says: "From the above facts, the recommendation of Governor Hughes, the action of the Legislature in the Fuller bill, and the efforts of the state water supply commission, it is evident that the possibility of a 'just regulation for the public benefit' by the state of such water powers as those proposed to be used by the Hudson River Electric Power Company has been more than seriously considered—the first legislative step has been actually taken." The opinion of Commissioner Osborne is, that while the commission is not called upon to decide as to whether such policy is or is not a wise one, or whether, being wise or unwise, it is likely or not to be carried out by the state either now or in the future, yet in view of this fact, it devolves upon the Public Service Commission to see that nothing be done which may prejudice the state in any present or future policy which will not leave the state the utmost freedom of action in dealing with the development of these water powers.

Mr. Osborne quotes section 55 of the Public Service Commissions law, forbidding the capitalization of franchises, and says: "These provisions as well as the whole trend of the law show clearly that the Legislature did not intend to allow certain powers granted by state or municipality to inure to the benefit of private individuals in the case of public utilities; and while the Legislature has not by any means so clearly or fully declared itself in the policy concerning the water courses of the state, it has indicated a possible policy to be pursued by the state in which the same principles which underlie its present attitude toward its public utilities may possibly be assumed in the future toward its water powers, which, as the Governor has pointed out, may be developed and utilized by the state to great public advantage."

Mr. Osborne closes as follows: "When the choice comes squarely between rejecting or granting the application of the Hudson River Electric Power Company, there is this further consideration: The conditions seem to be such that if the state should ever determine to develop the water power of the Sacandaga Valley it could do so with such manifest advantage to the Hudson River Electric Power Company that there is every reason to believe that the company would have every incentive to further rather than hinder such development. The self-interest of the private owners may thus yield to the state what the state might better have the legal right to exact. While, therefore, I should greatly prefer to have such conditions embraced in the order as would give the state the legal right to assume control of the water power any time within a given number of years, I concur in the opinion of Commissioner Decker and the granting of this application to construct and operate under the franchise of the applicant."

Eliminating Disturbances on Telegraph Lines.

The accompanying illustration shows a scheme for neutralizing electromagnetic and electrostatic disturbances to telegraph circuits by single-phase railway lines, as disclosed in a patent issued Dec. 10, to Mr. J. B. Taylor. Energy is supplied from the high-tension conductors to the trolley circuit through step-down transformers, of which three are shown. The trolley wire is arranged in sections, each section extending from one transformer station to another. The central point of the secondary of each sub-station transformer is connected to earth, and the outer terminals of the secondary winding are connected to the ends of the two sections ending at that sub-station. With this arrangement it will be seen that at the instant when one section is at a positive potential with respect to earth the adjacent section will be at an equal negative potential. Consequently if a low-voltage conductor *C* extends parallel with and adjacent to the working conductor, the static inductions of the two sections on the conductor *C* will neutralize each other. Since the currents in the two portions of each section of the working conductor supplying energy to a car neutralize each other, as far as magnetic induction upon the adjacent conductor *C* is concerned, practically all inductive effects upon the conductor *C* are avoided.



TAYLOR SYSTEM OF DISTRIBUTION.

Arrangements at the Chicago Electrical Show.

The general plans for the Chicago Electrical Show have already been noted. Subjoined is a list of the special days at the show and the features associated with them:

Monday, Jan. 13.—Opening night. Souvenir post cards showing interior view of electrical show will be given away.

Tuesday, Jan. 14.—Ladies' souvenir day. A gold hat pin will be given to each lady visiting the show on this day.

Wednesday, Jan. 15.—Students' Day. Special demonstrations of scientific apparatus will be given and new developments shown in electrical devices.

Thursday, Jan. 16.—Societies' Day.

Friday, Jan. 17.—Joint meeting of the Illuminating Engineers' Society and the Northwestern Electrical Association.

Saturday, Jan. 18.—Annual meeting of the Electrical Salesmen's Association.

Monday, Jan. 20.—Rejuvenation of the Sons of Jove. Souvenir for everybody.

Tuesday, Wednesday and Thursday, Jan. 21, 22 and 23.—Annual convention of the International Independent Telephone Association will be held in the Coliseum Annex Hall. Miniature telephones will be distributed as souvenirs on Tuesday, Jan. 21.

The Decorative Lighting of the 1908 Chicago Electrical Show.

The scheme of decorative lighting while is being carried out for the Chicago Electrical Show, to be held at the Coliseum in Chicago, Jan. 13 to 25, is one of the most notable examples of interior lighting of an exposition building ever offered. It has probably never been surpassed in the history of shows and expositions of this kind. The decorative lighting is a part of a general architectural scheme of decoration which has been worked out by D. H. Burnham & Company, architects. The exhibitors' booths are to be of uniform design. The lamps for decorative lighting will be hung in festoons from the roof girders and from between the posts at the corners of exhibitors' booths and on massive chandeliers.

Fig. 1, reproduced from the architect's painting, shows the general appearance of the building as decorated. Fig. 2 is a cross-section drawing of the Coliseum Building, showing the position of the bunting and the festoons of lamps. The bunting will form a false ceiling for the building when it is decorated. This bunting is hung from the roof girders. It is notable that this will be the first time in the history of this well-known

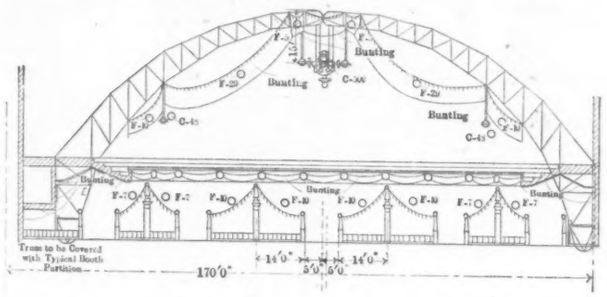


FIG. 2.—CROSS-SECTION OF COLISEUM.

structure that the illumination is to be from festoons of this kind instead of from lines following the roof trusses. The effect of this decoration is to change entirely the apparent contour of the roof. In Fig. 3 is illustrated a longitudinal section of the building, which shows the festoons along the side of the building and also the locations of the row of great central chandeliers, designed especially for this occasion. Besides these chandeliers, there is a central canopy which serves the double purpose of a chandelier and support for festoons of bunting. In Figs. 2 and 3 the number of sockets on each festoon is indicated by the number within the circle.

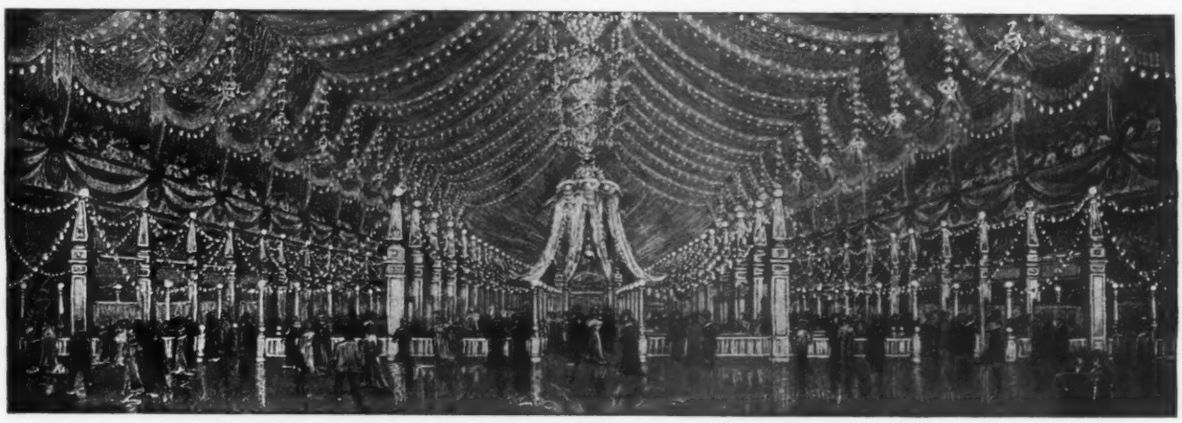


FIG. 1.—PERSPECTIVE VIEW OF CHICAGO ELECTRICAL SHOW DECORATIONS.

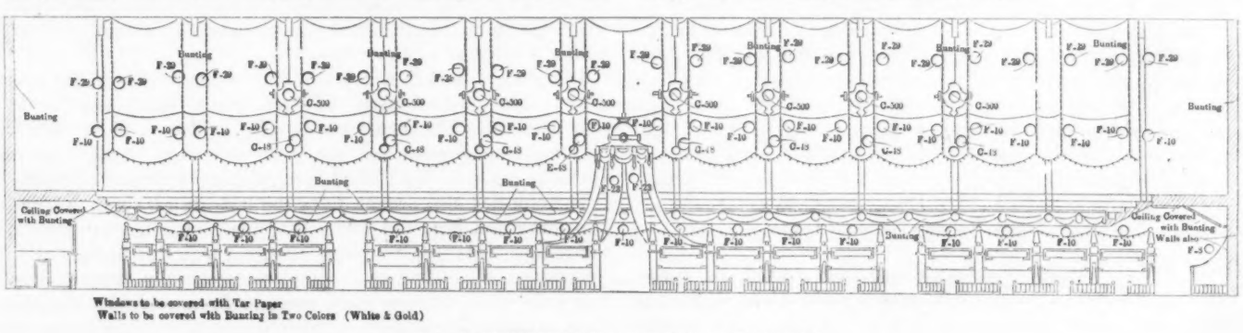


FIG. 3.—LONGITUDINAL SECTION OF COLISEUM.

One of the special features of this lighting is a number of specially designed papier-mâché chandeliers. There are eight 275-lamp chandeliers hung from the center of the building,

flanked on each side by smaller 41-lamp chandeliers. The positions of these chandeliers can be seen from Figs. 2 and 3. The general lines of these chandeliers are spherical and hemispherical, as seen in Fig. 4. Fig. 5 shows the detail of the canopy which forms the central feature in the building.

The following is a schedule of the lamps to be used in the decorative lighting, not including any lamps installed by exhibitors for their own special purposes.

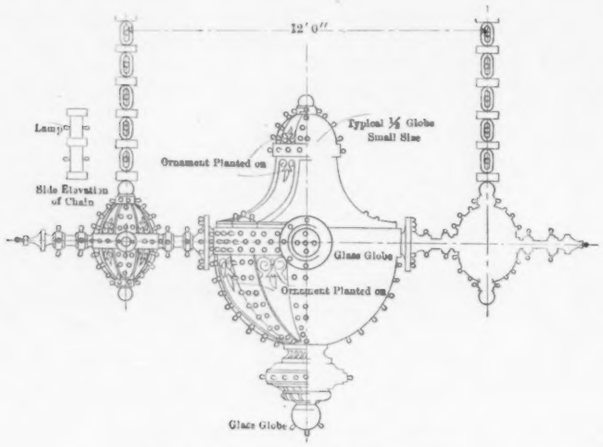


FIG. 4.—ELEVATION OF CHANDELIER.

The general dimensions of the building are about 300 ft. x 170 ft., and from the floor to the highest point in the ceiling is about 70 ft. The mean spherical candle-power of the lamps used for decoration totals over 45,000, making about 570,000 lumens for a floor area of 51,000 sq. ft. If 30 per cent of the total light generated reaches the plane of the exhibits, the illumination on the exhibits will be over 3 foot-candles from this decorative lighting alone. The bunting which fills in the spaces between the festoons of lamps, as shown in Fig. 3, is to be gold and white; that is, it is to be white between the festoons of a pair, while the greater space between pairs is to be gold.

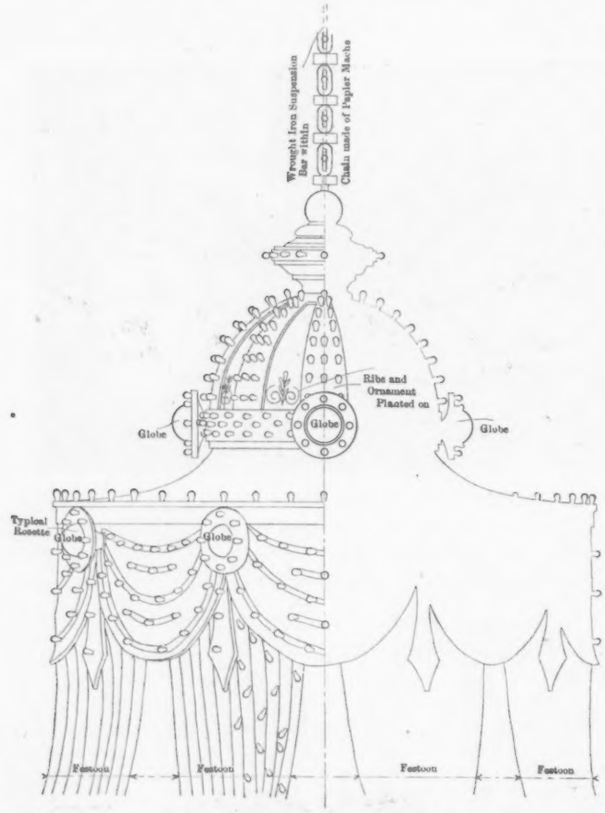


FIG. 5.—ELEVATION OF CENTRAL CANOPY.

	Designation.	Candle-Power.	No. of Sockets.
207	10-lamp festoons	4	2070
100	7-lamp festoons	4	700
20	11-lamp festoons	4	220
18	17-lamp festoons	4	306
14	9-lamp festoons	4	126
4	6-lamp festoons	4	24
5	8-lamp festoons	4	40
4	14-lamp festoons	4	56
48	10-lamp festoon ceiling	2	480
48	29-lamp festoon ceiling	2	1392
319	1 lamp on posts (Gem)	40	319
8	275-lamp chandeliers, large	2	2200
16	41-lamp small chandeliers	2	656
388	1-lamp central feature	2	388
13	1-lamp globes, central feature	40	13
1	Sign—buffet	2	84
2	Signs—at annex independent telephone exhibit	2	496
22	19-lamp festoons between trusses	2	418
	Total sockets		9988
8	8-lamp clusters of arc lamps		64
2	flaming arc lamps, 10 amperes each		2

The windows will be covered to prevent daylight from interfering with the decorative lighting.

Kelvin Memorial Exercises.

Kelvin memorial exercises will be held at New York by the American Institute of Electrical Engineers in the Engineering Societies Building on Sunday, Jan. 12, at 3.30 p. m., lasting about an hour and a half. President Stott, of the Institute, will preside and kindred societies have been asked to be officially represented. Prof. Elihu Thomson will deal with Lord Kelvin's career as an electrical engineer. Prof. E. L. Nichols will speak of his work as a physicist and Mr. George G. Ward on his achievements in submarine cabling. One or two other aspects of his long and brilliant life will also be discussed. Music will be given during the exercises by the Hans Kronold orchestra. The exercises will be open to the general public.

New Harlem River Bridge.

On Monday, Jan. 6, the new bridge across the Harlem River, at 207th Street, New York, was officially declared open for traffic. The bridge is a swinging structure, opening horizontally upon a central pier and table. At present the opening of the bridge is accomplished by steam, but within the very near future alternating-current motors will replace the engines for its operation, the motors having already been purchased and mains run for the establishment of electrical service.

In 1903 the foundation of the bridge was laid, and the work pushed forward from that time. From Sedgewick Avenue and 184th Street, Bronx, an approach of granite masonry carries the roadway out over the tracks of the New York Central Railroad to the bulkhead of the river.

That part of the approach which is over the river is in three sections of steel construction. These three sections were formerly parts of the bridge over the Harlem Ship Canal, at West 221st Street, the old span being moved to its present location in the 207th Street structure, the transportation of the draw span, 170 ft. in length, being accomplished by means of floats within the period of three days.

The electric motors which will operate the bridge in the very near future will consist of two 20-hp two-phase induction motors. The approach to the bridge will be lighted by alternating-current arc lamps, all the energy being supplied from the mains of the United Electric Light & Power Company.

The city has also provided for the lighting of Tenth Avenue, Broadway and Emerson Street near the Manhattan entrance of the bridge. Very shortly Nagle Avenue will also be lighted by electricity, thus forming a complete electrically lighted thoroughfare from the City Hall, through Broadway, St. Nicholas Avenue and Nagle Avenue, to the Bronx, no lighting by gas in the vicinity of the bridge having been provided for. All of the lighting service, together with the motive power of the bridge, will be supplied from the mains of the United Electric Light & Power Company.

Combined Steam and Gas Engine.

In a paper dealing with the evolution of the internal combustion engine presented at the New York meeting of the American Society of Mechanical Engineers, Mr. S. A. Reeve called attention to the possibilities of development along the line of continuous combustion under constant pressure. In order to eliminate the high operating temperatures in gas engines, the author proposes the use of the products of gas combustion to make steam before attempting to drive a piston with them; the heat of the gas should be transferred directly to the water by actual contact. To obtain the desired result, the gas flame may be generated upside down over water, and the products of combustion passed into the water. The furnace thus produces a mixture of superheated steam, nitrogen and carbon-dioxide, which is used directly in a reciprocating engine which differs immaterially from the ordinary steam engine. It is claimed that this method of utilizing the energy of the gas is more advantageous than employing the gas in an explosive type of engine. In comparison with the operation of a steam engine in the usual way, the method proposed avoids the presence of a steam boiler under pressure and the transmission of heat through metals. Moreover, high thermodynamic efficiency is obtained by expanding the steam from the highest practicable temperature of superheated steam down to the lowest temperature of exhaust which is useful with steam, yet without the use of a condenser, or an air pump.

CURRENT NEWS AND NOTES.

EARTH WIRELESS TELEPHONE.—A Wilkes-Barre, Pa., dispatch states that John Grehowski, 20 years of age, has talked by wireless telephone through an earth circuit a distance of 1000 feet. It is stated that the waves are communicated to the earth by means of a 6-ft. rod.

REGULATION IN NEW YORK. —In his annual message Governor Hughes has recommended to the legislature that telephone and telegraph companies be included in the jurisdiction of the Public Service Commissions, and be regulated as the street railways, lighting systems and other utilities are now.

CORPORATION TAXES IN NEW JERSEY.—The New Jersey State Board of Assessors has filed its schedules showing the taxes levied for the year 1907 against six classes of public utilities, which are taxed on the basis of gross receipts, 2 per cent being the rate. Street railway companies are taxed $265,517.52; gas and electric companies, $244,775.72, and telegraph and messenger companies, $910.47. The total tax on the six classes of concerns is $626,212.86.

MARCONI DEVELOPMENTS.—Before sailing from Halifax for England in the steamer "Tunisian," Mr. Marconi last week stated that the Clifden-Glace Bay system is now handling about 1500 words of press matter across the Atlantic, but that in three weeks it would take any amount of business offering. When he returns next month Mr. Marconi will have something to say as to transcontinental and Pacific Ocean work, now under discussion. During February he is to lecture on his work before a joint meeting of the American Institute of Electrical Engineers and the New York Electrical Society.

FRENCH POSTAL TELEGRAPHY.—It is announced from Paris that M. Simyan, French Minister of Posts and Telegraphs, has just made an important reform which will go far to remove the criticism to which the French postal service has long been subjected. The reform takes the shape of a "letter telegram." When a French citizen misses the last mail for some point in France, however distant it may be, he may turn his letter in at a special wicket and by the payment of a very small sum have his letter or letters transmitted by telegraph during the night. At the place of destination the letter thus telegraphed will be placed in an envelope and delivered by the postman on his first rounds the next morning. This is practically the "telepost" system now struggling for a place in the American telegraphic economy.

TREATY ON WIRELESS.—A meeting of the Senate Committee on Foreign Relations has been called at Washington this week to consider the treaty on wireless telegraphy recently transmitted to the Senate by the President. John W. Griggs, ex-attorney general, and now the attorney for the Marconi interests, will be heard in opposition to the treaty. The article of the treaty which provides that wireless messages shall be exchanged between ships and coastal stations and between ships themselves, regardless of the particular system adopted by ships and wireless stations, is not regarded favorably by Marconi, as his attorney will set forth. It is understood that the statement of Admiral H. N. Manney, a member of the United States delegation attending a Berlin wireless conference, regarding the disputed article has been obtained by the committee.

PRODUCTION OF HOMOGENEOUS BODIES FROM TANTALUM.—In the production of homogeneous bodies from tantalum it is usual to employ powdered tantalum as the starting material, solid bodies being made by compression. These bodies are heated to their melting point in an indifferent atmosphere between two electrodes by the electric current. The melting operation necessitates a relatively small expenditure of energy when the body which is to be melted is itself employed as a positive electrode in the formation of the arc formed by the current. With a very high vacuum, however, the arc passes with difficulty between the electrodes. According to a patent issued Dec. 17 to M. von Pirani, electricity may be made to pass of its own accord to the electrodes. A metallic oxide which emits ions when heated is arranged in a combustion furnace in connection with the cathode, for the purpose of facilitating the passage of electricity between the electrodes, even with very high vacuum. The oxide is connected with the cathode, and the heating is effected by means of a wire embedded in the oxide, which is heated by an electric current. It is stated that barium oxid is particularly suitable for the ionization; but that strontium oxid, calcium oxid, or magnesium oxid, or other oxids may also be employed.

ONE FEATURE OF RELIEF.—A leading financial writer discussing the general situation in the *New York Times* says: "There is every reason to believe that the American public has become pretty well convinced of the fallacy of municipal ownership. If this proves to be true, it is bound to have an important effect upon the demand for securities of all classes. It will have a good effect upon demand for municipal securities. Several years ago Sir Felix Schuster, governor of the Union Bank of London, said to me that he felt that municipal ownership had been carried so far in Great Britain that nearly every municipality was on the verge of bankruptcy. The result of investigations by thoroughly competent and impartial commissions has shown that municipally owned railways, telegraphs, public utilities and industrial concerns do not give nearly as good service, and that, although they may give lower rates to consumers, they invariably bring about great increase in taxation, and if they give anything like the service demanded by the public they are bound to dangerously increase the public debt. Furthermore, when the public is convinced that the policy of all branches of Government will be strongly against confiscatory methods, and that their efforts will be in good faith directed only toward reasonable regulation, and that corporations are simply combined enterprise for mutual advantage, and that the corporate form has aided the development of mankind, and if given a fair show and properly regulated will continue to aid mankind as no other force is able to do, individuals who now have a fear of the stability of corporations will gladly invest their savings in the securities of those combinations of capital whose management has made a satisfactory record."

SUBMARINE TELEPHONES.—Advices from Paris state that as the result of elaborate experiments to prevent the recurrence of accidents to submarine vessels, the minister of the navy has issued orders that all submarines be fitted out with detachable telephone buoys, which, in case of accident, will permit of communication with the surface.

OVERSHOES FOR GLOVES.—In Williamsburg, Brooklyn, last week, seeing two boys receiving shocks from a telephone wire that had fallen on them and was crossed with a trolley feed wire, a young woman took off her rubber overshoes, used them as gloves and pulled the wire away, tying it around a pole. The crowd tried to dissuade her from the attempt. She refused to give her name. The boys, whose lives had been saved, were taken to a hospital.

AN ADMIRABLE STRIKE.—The employees of the Pana, Ill., Gas & Electric Company were recently called out on strike by the Federation of Labor because the night engineer had been discharged. He had broken two important and proper rules. One offence was that he did not blow the warning whistle to employees out on the line, and the other was that he allowed visitors to enter the dynamo room. It is difficult to understand how man can strike in support of such conduct.

CANADIAN TELEPHONE.—It is announced from Winnipeg that the arrangements have been completed for the transfer to the Manitoba Government of the entire system of the Bell Telephone Company in the province for a consideration of $3,500,000, payable in 4 per cent Government bonds. At a cabinet meeting, Tuesday, the fact was noted that the transfer would be completed by Jan. 15. This is a preliminary step to the acquirement of the Bell systems by Alberta and Saskatchewan.

READING IN BED.—The Commonwealth Edison Company of Chicago, in a recent advertisement under the heading "The Habit of Reading in Bed," calls attention to the luxury of reading in bed, a practice which can only comfortably and safely be indulged in without eye strain when electric light is used. It points out the fact that reading in bed has been considered injurious largely because of poor light coming from an improper angle. With electric light, it is possible to hang a portable fixture directly over the head of the bed which will throw the light down on the reading page and will not shine in the eyes. The charms of this habit, as depicted in Barrie's delightful little essay on the subject, are heightened and enhanced by electricity as thus applied.

OWNERSHIP IN CLEVELAND.—Special dispatches from Cleveland state that Mayor Tom L. Johnson, in order to gain money for his municipal ownership program, including electric lighting, the taking over of all gas companies except the East Ohio, and eventual city ownership of street railway lines, will seek means to raise $60,000,000 in the Legislature this winter. Two plans are suggested. By the first the Longworth act would be amended to permit issuing bonds without vote of the people on more than 1 per cent of the tax duplicates, the present limit, while a joint amendment would give to the mayor power to name the real estate valuation board, which could raise taxes. The other contemplates authorizing the issue of industrial bonds, the mortgage being on the property of the city rather than on the taxable property of the citizens.

TUNGSTEN LAMP.—A United States patent granted on Dec. 17 to Mr. Charles van Brunt and assigned to the General Electric Company is interesting in indicating probable developments of the tungsten lamp. It relates to a process of purifying metallic compounds, especially tungsten trioxide. The process is one of fractional precipitation and from the chemical standpoint the use of organic bases for the precipitation is the principal feature. While with the old method of repeated evaporations and crystallizations such purification as is necessary for this purpose requires a week or two, the new method enables one to purify a complete batch of oxide in a single day. The purified tungsten trioxide is an almost fluffy, impalpable powder and is reduced to pure tungsten by means of hydrogen. Tungsten filaments made in this way are "strong, free from cracks and imperfections, and for a short time, at least, will operate at a temperature corresponding to a specific consumption of only a few tenths of a watt per candle."

"ELECTROMOBILE."—Lord Halsbury, in the British Court of Appeals, has just decided that "electromobile" is not a special designation, but a plain, ordinary, "common or garden" word. A suit had been brought to restrain from the use of the precious word, and a refusal to enjoin was followed by the appeal, now denied. Lord Halsbury gave judgment. He said the question was simply one of fact, and, viewed as a matter of fact, there seemed to him to be no reasonable probability of confusion between the two names. The degree of probability of confusion arising by people being deceived depended very often upon the nature of the name. In this case an injunction was asked to restrain a new company taking two words. "Mobile" was a good classical French word, and "electro" was applicable all over the world to electricity. Those names signified the qualities of the carriage. He did not believe that the word "Electromobile," which was admitted to be a generic word describing a car driven by electricity and having the power of motion, had from 1902 been so specifically appropriated by any particular company that it would lead people to be deceived if two companies having that word in their registered names were permitted to co-exist. The question was always one of fact. If the name sought to be restrained was one which merely conveyed, whether accurately or not, the qualities of a thing, it required clear evidence to establish the fact that it would lead to deception. Proper names were distinctive enough, although, as a matter of fact, he did not deny that even a person might be restrained from using his own name if, in point of fact, a particular thing had become identified with that proper name. Lord Justice Vaughan Williams and Mr. Justice Bingham concurred. The appeal was dismissed with costs.

THE FUNERAL OF KELVIN.—In a letter to a friend in this country, Mr. Joseph Wetzler, of New York, who represented the American Institute of Electrical Engineers, at the Kelvin funeral in Westminster Abbey, with Mr. H. F. Parshall, says: "I have never attended an occasion of greater solemnity. In keeping, as it were, with the spirit of the occasion, the heavens were covered with a black pall, so intense and dark that not only indoor, but outdoor illumination was required everywhere in order to pick one's way into the Abbey. Every seat in the great and glorious old pile was filled to overflowing and one could see at a glance that it was not idle curiosity but a genuine affection that had drawn so large a gathering to pay the last respects to the noble departed. I was seated in the Poets' Corner, and while waiting for the service to begin glanced around me and read the names on some of the monuments, names of third-rate poets one never hears of; I could not help thinking how little England had appreciated some of the men who have made her really great. To think that since Newton's time only half a dozen leaders in Science have been buried in the Abbey is enough to make one weep. Very appropriately Kelvin's remains have been placed next to those of Newton—a worthy juxtaposition. As I came away I recalled the great privilege and pleasure it was to me to have dined with Lord Kelvin. I shall never forget the impression made upon me at such close range. With all his greatness, he had the rare simplicity of the child, and I remember particularly the youthful glee with which he showed me the new Spinthariscope of Crookes, which revealed the apparent movement of the particles of radium under a strong magnifying power. The élite of British science was at the funeral, and one heard on all sides the stories of his knowledge, insight and lovable qualities."

General Office Building of the Philadelphia Electric Company.

THE new office building of the Philadelphia Electric Company, at Tenth and Chestnut Streets, is a fireproof structure built on a steel skeleton, with floor construction of steel girders and floor beams arched between with reinforced concrete. The building is seven stories high, above the basement, and has a frontage of 32 ft. on Chestnut Street, 229 ft. on Tenth Street and 32 ft. on Sansom Street. It is obvious that a building of this shape, fronting on three streets, permits of ideal lighting and ventilation.

The exterior of the building was designed with a view of giving the structure an appearance of dignity and strength befitting the home office of one of the largest and most important corporations in the city of Philadelphia. The architecture is simple in motif, and the materials used are a combination of Indiana limestone and hard, red brick, laid in Flemish bond with a white mortar which brings out the full richness of tone and color of the brickwork.

FIG. I.—GENERAL VIEW OF DISPLAY ROOM ON MAIN FLOOR OF THE PHILADELPHIA ELECTRIC COMPANY'S OFFICE BUILDING.

The main entrance of the building is on Chestnut Street, opening into a dignified and imposing display room. There is perhaps no business house in Philadelphia which contains anything that is better, architecturally or artistically, than this apartment. This display room acts as an ante-room to the various offices throughout the building, and in it are exhibited all the lighter and more attractive pieces of electrical apparatus —particularly the smaller electric lighting, cooking and heating utensils. A specialty is made of a portable electric lamp exhibit; this dispay being in keeping with the handsome appearance of the room, and also helping at night to make the view, from both Chestnut and Tenth Streets, through the large plate glass windows, most attractive. The rest of the first floor is devoted to the cashier's and stock transfer offices, waiting room and other general offices of the company largely used by customers; while in the rear are located the record and lamp departments for the local district. A special entrance on Tenth Street has been provided for persons renewing lamps, etc., and the rear entrance, on Sansom Street, is used for freight.

In the basement immediately beneath the first floor display room is a similar room, used for exhibition purposes. In this room all the heavier electrical apparatus is exhibited. It is fitted up as completely as space will permit, and contains all the apparatus which is in daily use in places of business, as well as dwellings. To the rear of this display room is the mailing department, office of the superintendent of the building, mechanical plant and main switchboard, lamp and stationery rooms, locker rooms, etc. Light and ventilation are furnished to the basement by means of an area-way lined with white enamel brick and covered with an iron grating extending along the Tenth Street front of the building.

On the second, third, fourth and fifth floors are the offices of the various officials of the company, with their clerical forces, and the necessary adjuncts of fireproof vaults, storage, etc. On the sixth floor is located the auditorium or assembly room. This auditorium is used for the monthly solicitors' meetings, and also for the meetings of all the other employees' associations. No attempt has been made to secure an elaborate or luxurious effect in this room. It is comfortable and well ventilated. From the switchboard in one corner of the room both direct and alternating current may be obtained; gas outlets are also provided at this point, so that illustrated lectures or demonstrations of any nature pertaining to electricity or gas may be given. Adjoining the auditorium, on the same floor, are located committee rooms, cloak room, and a library for the employees. The latter room will be completely equipped with books of a technical character, and with all the electrical magazines and periodicals.

The Philadelphia Electric Company has extended to the American Institute of Electrical Engineers and to the Illuminating Engineering Society the privilege of using the auditorium for their monthly meetings, subject, of course, to the rules regulating the building, and the Philadelphia sections of both these bodies have accepted this offer.

The lighting scheme for the building was devised by the offi-

cials and engineers of the company, in consultation with the architect, and, when finally completed, they are of the opinion that the results will be satisfactory in every particular.

The entire equipment of the building, in fact, every important detail of the structure, has been given the thought of President Joseph B. McCall and his executive staff, with a view of obtaining a result which would convey an impression of solidity and practicability rather than one of extravagant and unnecessary ornamentation.

The building is heated from the commercial steam mains of the company, the system used being the Werren-Webster direct steam radiation, operated by two 5½ in. x 8 in. vacuum pumps, one being a reserve.

Owing to the favorable location of the building it was not considered necessary to install a mechanical system of ventilation.

Two passenger elevators, one combination passenger and freight elevator, and an automatic electric dumb waiter, all of the Otis make, have been installed; the two passenger elevators being in the front of the building and the combination elevator and dumb waiter being in the rear.

One of the passenger elevators is of the traction type with a lifting capacity of 2500 lbs. at a speed of 600 ft. per minute, the motor being rated at 150 amperes, 220 volts, 625 r. p. m., and the other passenger elevator is a standard worm-gear and drum type, having a lifting capacity of 2000 lbs. at 400 ft. per minute, the motor being rated at 145 amperes, 220 volts, 800 r. p. m. These elevators are equipped with the Otis magnet control and flashlight signal system.

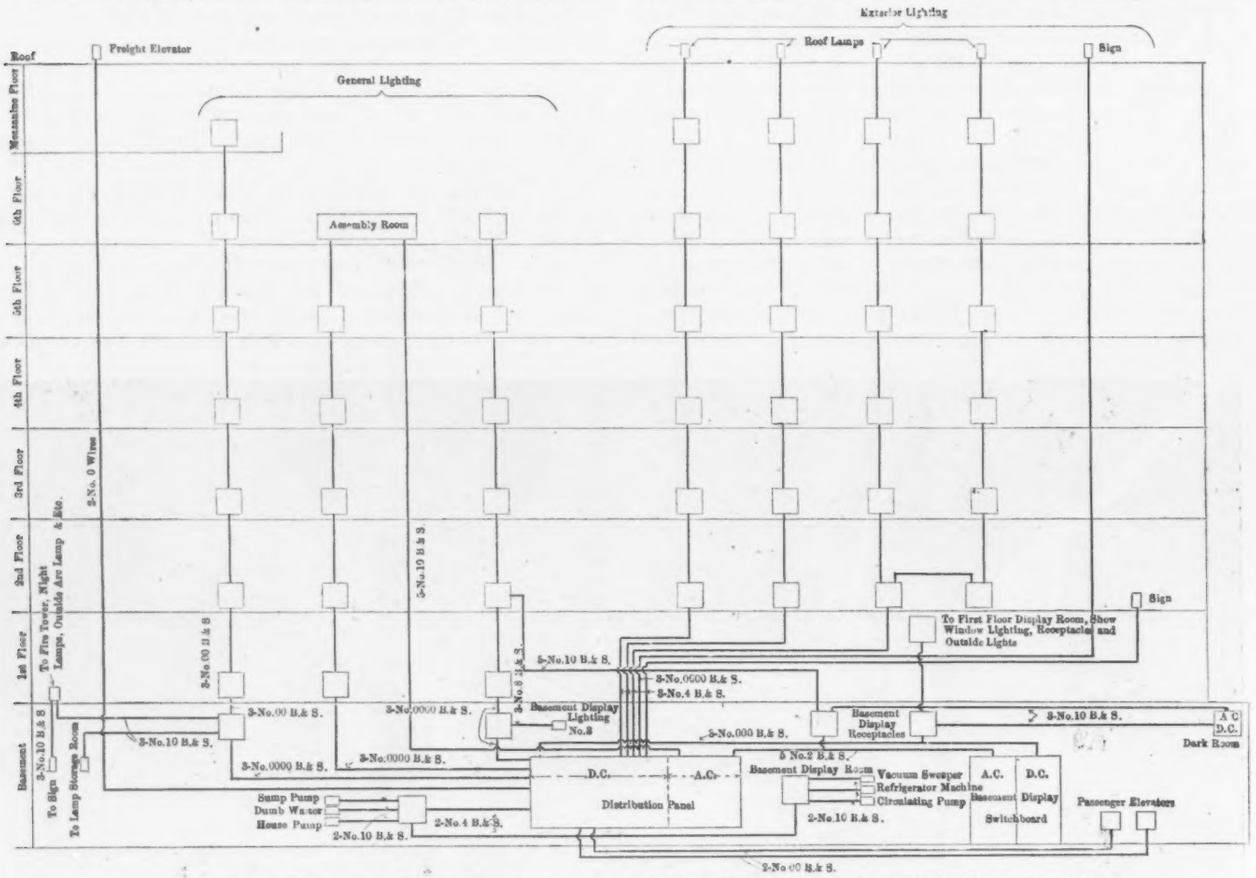


FIG. 2.—ARRANGEMENT OF FEEDER CIRCUITS IN OFFICE BUILDING OF PHILADELPHIA ELECTRIC COMPANY.

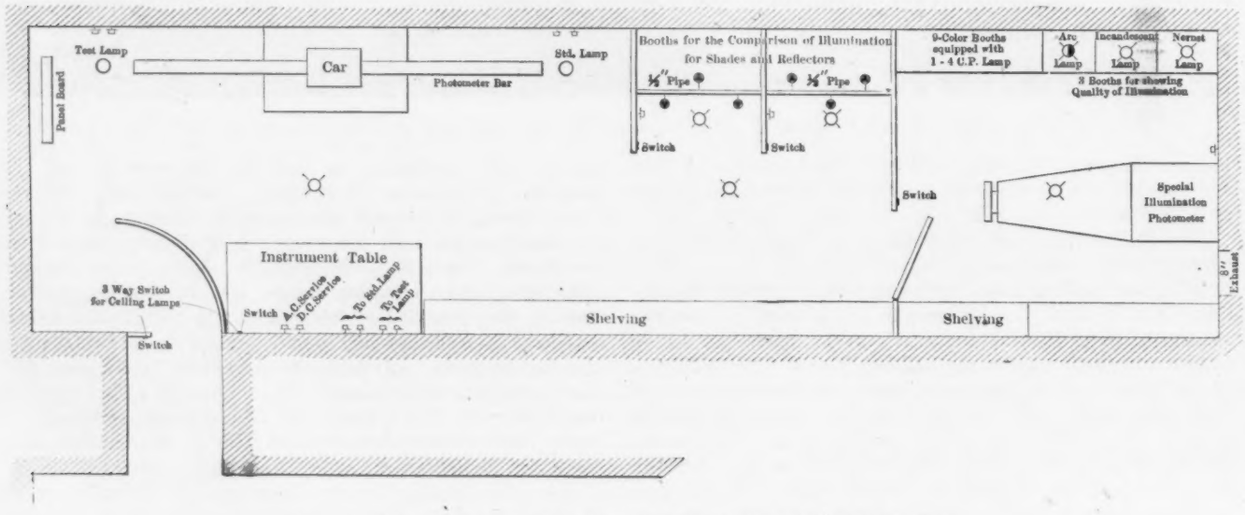


FIG. 3.—PLAN VIEW OF PHILADELPHIA ELECTRIC COMPANY'S DARK ROOM.

The combination passenger and freight elevator is also of the worm-gear and drum type, with a lifting capacity of 2000 lbs. at 300 ft. per minute, or 5000 lbs. at a lower speed. The dumb waiter has a capacity of 200 lbs. at 300 ft. per minute, and can be called to or dispatched from any floor by a series of push buttons located on each floor, but the car cannot be interfered with if already in use, cannot be started until the doors are locked, and none of the doors can be opened unless the car is opposite that particular door.

The motors and driving mechanism of the two passenger elevators are located in two clear, wire glass and iron enclosures

FIG. 4.—ONE CORNER OF BASEMENT DISPLAY ROOM.

in the basement display room. The dumb waiter mechanism is similarly enclosed in the rear end of the basement, while the motor, etc., for the combination elevator is located in the top of the fire tower.

The sump pit is equipped with a centrifugal pump driven by an automatically operated 2½-hp Diehl motor.

The house pumps consist of one duplex steam and one triplex pump, direct connected to a 3-hp, 220-volt, General Electric motor, automatically controlled by a pressure regulator and Cutler-Hammer starter.

A rotary fire pump is used. This is direct-connected to a 55-hp General Electric motor.

The refrigerating plant for drinking water consists of a Larsen-Baker ammonia compressor of 2-ton capacity, the water tank, freezing coils and condenser being located in the vault under the Tenth Street pavement. This machine is driven by a 5-hp, 220-volt, Northern variable-speed motor. The water is delivered to drinking fountains on each floor, the circulation being maintained by a 1-in., two-stage Worthington turbine pump, driven by a 1-hp, 220-volt, 2400 r. p. m. Rossmassler-Bonine motor.

A vacuum cleaning and sweeping plant, manufactured under the Lotz patents and furnished by the Sanitary Dust Removing Company, has been installed. The machine is operated by a 7½-hp, 220-volt Westinghouse motor, and has a rating sufficient to operate four nozzles. The dust tanks are located in the vaults under the pavement.

The main switchboard is of a type which would ordinarily be installed in any building of this size, and is so arranged that

FIG. 6.—NIGHT VIEW FROM THE STREET OF MAIN FLOOR DISPLAY ROOM.

the energy used for various purposes is metered separately, the sub-divisions being as follows: General lighting; signs; exterior lighting; basement and first floor, direct-current exhibits; basement and first floor, alternating-current exhibits; passenger elevators; freight elevator, and miscellaneous motors.

Three sub-meters are connected in series with the meter for miscllaneous motors, these being for the refrigerating machine, vacuum sweeper and circulating pump.

An auxiliary switchboard is erected in the basement display room for controlling the various exhibit circuits. This board is equipped with direct-current and alternating-current panels and is arranged so that temporary connections may be made for exhibition or testing purposes.

The building has been wired for three-wire, 110-220-volt direct-current service, and an alternating-current service has also been introduced for furnishing single-phase and two-phase 110-220-volt current for use in the display room, dark room, and for experimental and lecture purposes in the assembly room on

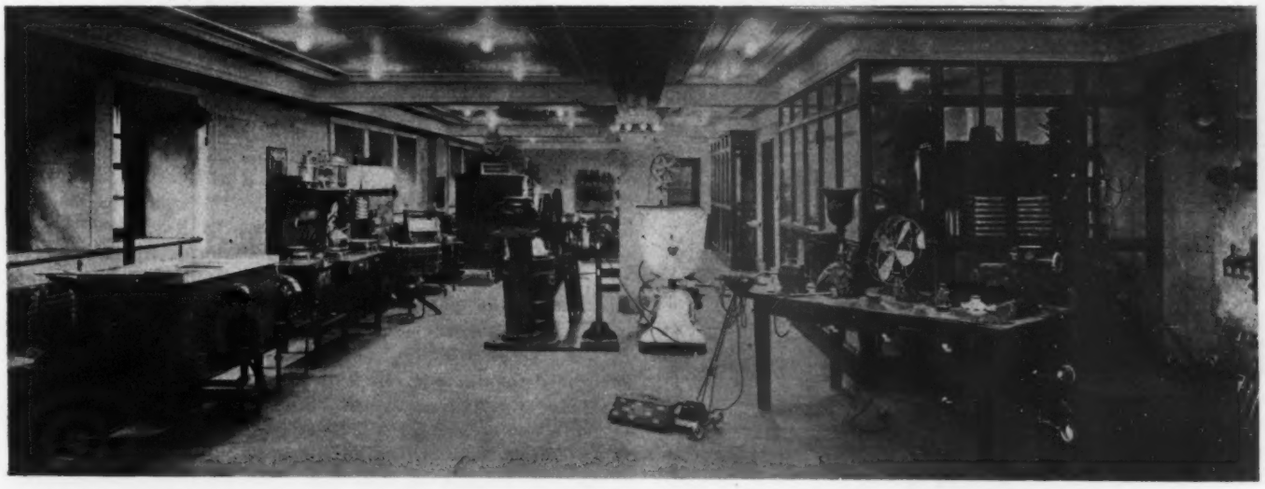


FIG. 5.—GENERAL VIEW OF WORKING EXHIBITS IN THE BASEMENT DISPLAY ROOM OF THE PHILADELPHIA ELECTRIC COMPANY.

the sixth floor. A diagram showing the general arrangement of and wiring is shown in Fig. 2.

The panel boards generally used throughout the building are of the plug-fuse type, with polished copper finish on black enameled slate. The panel controlling the basement display room lighting circuits is one of the exceptions, this having push-button switches in the metal trim of the panel, as shown in Fig. 9. The panel boards in the first floor display room are also worthy of mention, being of the ordinary knife-switch and

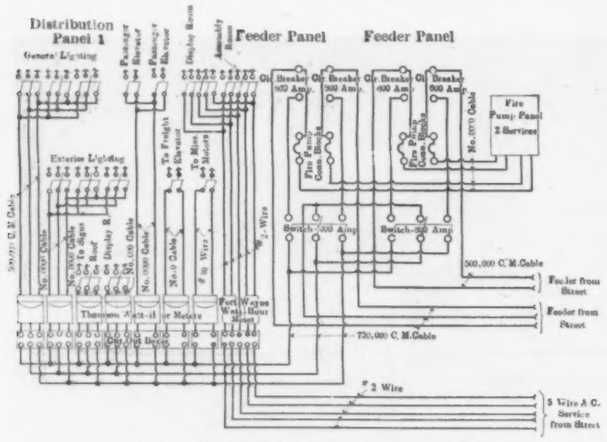


FIG. 7.—SWITCHBOARD WIRING DIAGRAM.

enclosed-fuse type, but illustrating, with their marble and gold finished metal trims, that a panel board can be made ornamental as well as useful.

In the illumination of the building, the general idea of introducing as many different methods of lighting consistent with certain standards of efficiency was followed, making the entire illumination of the building more or less an exhibition of such methods, which, while not all being equally as efficient, are fair examples of various methods in which customers are likely to be interested.

The basement display room having a low ceiling, the lighting is accomplished by studding the panelled ceiling with 16-cp, round-bulb frosted lamps, so arranged that each panel may be lighted separately. The two columns are surmounted with bands of similar lamps. The column lighting, however, is not

FIG. 8.—AUDITORIUM ON TOP FLOOR.

used in conjunction with the ceiling lighting, but is installed merely to demonstrate this form of lighting to those interested.

The hallways throughout the building are all lighted by means of high-efficiency lamps of various sizes equipped with bowl reflectors installed close to the ceiling, while the night lamps for illuminating the hallways are on separate circuits and are mounted on brackets of the torch pattern installed at the stairways.

A large room on the second floor is illuminated by 10 three-glower Nernst lamps equipped with Holophane hemispheres. The assembly room on the sixth floor is illuminated with General Electric arc lamps equipped with concentric diffusers, the body of the lamp passing through the ceiling and allowing the diffuser to bear directly against the ceiling. Each of the six lamps used is controlled by a separate switch, and, in addition is operated by a solenoid switch controlled by several push buttons located in different parts of the room.

The first floor display room is beautifully illuminated by four specially designed Italian Renaissance electroliers, each having 25 16-cp, round-bulb frosted lamps. This room is also illuminated by 178 round-bulb, 16-cp frosted lamps located in the soffit panels of the planacea between the modillion brackets of the Corinthian cornice, thus showing different methods of lighting the room. The windows, which open into this room, are illuminated by "Frink" reflectors installed in the hollow transom bars between the upper and lower sections of glass, making a practically concealed form of lighting, very effective for windows of this description.

The offices in the rear of the display room on this floor are all lighted by means of Holophane clusters equipped with tan-

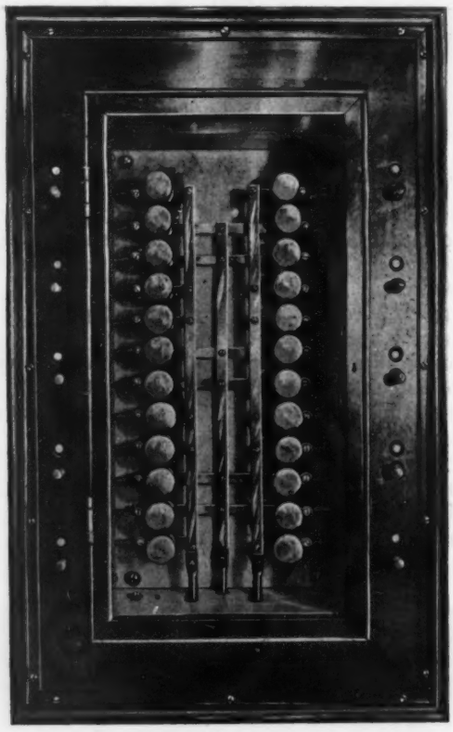


FIG. 9.—PANEL BOARD IN BASEMENT.

talum lamps. The other rooms and offices throughout the building are illuminated by a standard design of fixture, high-efficiency lamps installed in single units, and by clusters of various types equipped with the lamps best suited to the particular type of cluster or the space to be illuminated.

No other permanent illumination on the exterior of the building has been provided, except six massive torch-form of brackets located on the main piers of the building on the Chestnut Street and Tenth Street fronts. Four mains for exterior lighting, however, extend from the basement to the roof as shown on the wiring diagram, and brass-capped outlets have been left outside the building on each floor from each of these mains. Decorative lighting circuits on the exterior of the building can, therefore, be easily supplied with energy.

The dark room in the basement has been equipped with a standard photometer and the necessary instruments, and direct and alternating current, and also gas, are available at this point. This room also contains two booths fitted with ceiling and other

outlets for comparative displays of lamps and shades. Also a number of color boxes for illustrating the effect of different colored walls on illumination.

There are, in addition to the equipment already mentioned, three small booths containing, respectively, an arc lamp, a Nernst lamp, and an incandescent lamp, for making comparisons of the quality of the illumination on the same colors. The shelving for the display of Holophane glassware and other shades completes the equipment of this room, although it is proposed to install a special luminometer to show the comparative illumination from any angle of two different types of lamps, with or without shades. This luminometer will also be equipped with a standard lamp and scale, by which the candle-feet at any angle can be measured. The arrangement of the apparatus and also the disposition of the outlets for connecting the various lamps, etc., in circuit, are shown in the plan view of the room given in Fig. 3.

The basement display room, in addition to the machinery for the two passenger elevators, the refrigerating machine, ice-water circulating pump, vacuum sweeper and dynamotor for supplying energy to operate the bells and annunciators, which are a part of the mechanical plant of the building, contains a large and varied assortment of electrical apparatus supplied with electrical energy from both alternating and direct current circuits, all in practical operation.

The exhibition at the present time includes the following: Two telautograph stations, one at each end of the room; two methods of rectifying direct current, namely, a General Electric mercury arc rectifier and a Westinghouse two-phase motor-generator set and panel; two refrigerating boxes for domestic or small store use, etc., one being an ethyl chloride machine, practically automatic and working at a maximum pressure of 15 lbs., and also a Brunswick Refrigerating Company's box; a large number of 110 and 220-volt, direct-current machines, from the small 1/40-hp motor only 3½ ins. in diameter, to the larger sizes, and also 110 and 220-volt single and two-phase, alternating-current motors of various makes. These motors are connected in circuit showing different methods of starting, speed control, etc.

An exhibit which has attracted considerable attention is the "Reason" electrically operated shoe polishing machine. There are also a large number of articles for domestic use, such as a sewing machine, General Electric cooking table, ovens and utensils; also a Simplex ironing board and iron; Simplex cooking outfit, instantaneous water heater, electrically driven washing machine and wringer, Hutchinson carpet sweeper, buffing and polishing machines, coffee mills, meat choppers, portable vacuum cleaner, and a model automatic push-button elevator for residences, etc. Near the latter apparatus, the flasher, commutator and other mechanism for a talking electric sign are arranged for practical demonstrating purposes.

In the larger apparatus there are ventilating fans of several kinds, ice cream freezer and ice crusher operated by a 1¾-hp Westinghouse motor, dough mixer and egg beater operated by a 2-hp General Electric motor, Insinger dish washer operated by a ¾-hp motor, and a grinder driven by an enclosed motor built by the Northern Electrical Manufacturing Co., of Madison, Wis.

Another interesting exhibit is the ozone generator, manufactured by the Ozone Purification Company. There are, in addition, monogram flashers, sign flashers, fans and lamps of all descriptions, whirlers for window advertising, arc lamps and Nernst lamps, and a large number of other pieces of electrical apparatus.

In addition to the flush wall and floor receptacles located in this room, a double trench has been run around three sides of the room, with a section extending to the center, in order that additional electrical conductors, water, steam, and drain pipes could be run to any of the apparatus on exhibition requiring these connections.

The switchboard for this display room is erected immediately over the trench and the steam, water and drain connections terminate in the trench in order that connections to the present or future exhibits may be readily made.

Temperature Rise of Conductors.

By C. C. Badeau.

The existence of an electrical current in a conductor is always accompanied by the phenomenon of heat. With direct current, the resultant heat is always a function of the resistance and the amount of current. With alternating current, other factors enter into the problem, which complicate it somewhat, and the skin effects, iron losses, etc., all have a bearing on the resultant temperature. For moderate-sized apparatus, however, not containing iron, the temperature rise, either by direct or alternating current, is almost directly proportional to the square of the current. Experiments have shown that this ratio is practically constant between 0 and 100 deg. C., and is independent of the position of the apparatus; that is, whether the radiation be good or bad, the relative relations of the temperature rise at different currents is constant.

The accompanying chart, which is based on the above facts, is particularly useful in obtaining the temperature rise on over-

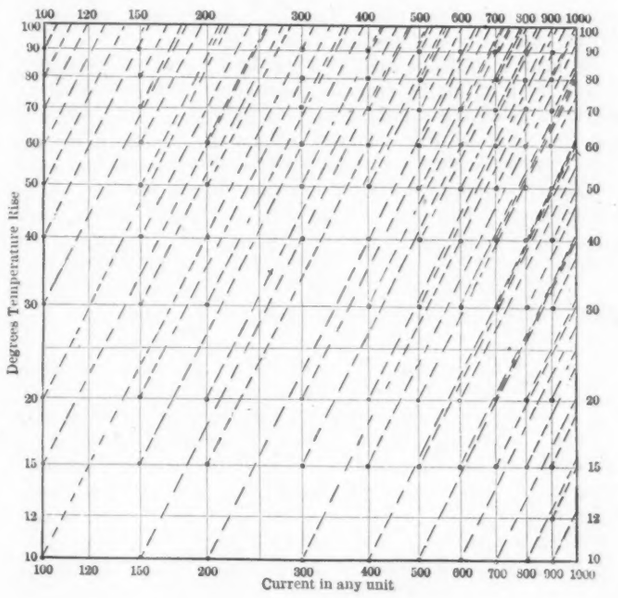


CHART SHOWING RELATION BETWEEN TEMPERATURE RISE AND CURRENT.

load of such apparatus as cables, switches, circuit breakers, bus-bars, etc., in which the entire loss is copper loss, though it may also be used to determine the overload temperature rise of machines, if the iron loss is known.

The chart consists of a number of straight lines on logarithmic cross-section paper. The horizontal cross-section lines represent degrees, Centigrade or Fahrenheit, and the vertical lines current in amperes, milliamperes, hectoamperes, or any other unit. The chart is used as follows:

Given the problem of a 200-ampere switch with a normal rise of 20 deg., what will be the rise on 300 amperes? Referring to the curve, the vertical line marked 200 is followed upward until it intersects a diagonal, which starts at 20 deg., being the normal rise of the apparatus. This diagonal is then followed upward until it intersects a vertical line at 300 amperes, being the amount of current which the apparatus is to convey. The horizontal line intersecting the vertical line at this point gives the rise in degrees, which is 45. In other words, a switch which will carry 200 amperes with a temperature rise of 20 will experience a temperature rise of 45 deg. when the current is 300 amperes.

The figures for the current or the temperature rise may be multiplied or divided by ten, without affecting the accuracy of the results. In fact, as will be noted, the chart is arranged for any temperature scale and for any scale of current, whether milli-amperes, amperes, or kilo-amperes.

A Deflection Potentiometer for Voltmeter Testing.[1]

By H. B. Brooks.

In a former paper[2] the writer derived an expression for the current through the galvanometer of an unbalanced potentiometer used in connection with a volt box, and showed how this formula could be applied to the design of a class of instruments, for current and voltage measurements, having properties intermediate between those of the balance type and of the deflection type. A description was given of an instrument constructed on this principle, which was used for measuring voltage in photometric work, and which has now been in service for the past two years, giving satisfactory speed and accuracy.

The object of the present paper is to show what features should be incorporated in an instrument of this kind for such work as the testing of voltmeters, and to describe an instrument of this type recently constructed. This has been designed for voltmeter testing and other precision measurements of voltage in the laboratory and testing room.

An instrument to be used as a standard for voltmeter testing should first of all be accurate, permanent and unaffected by magnetic fields and similar disturbing influences. This requires that the bulk of the unknown voltage be measured by the potentiometer method, as no known type of voltmeter, not even so-called "laboratory standard" instruments, will meet the above requirements. In order to save time and avoid the necessity for extreme steadiness of the test voltage, a small portion of the quantity should be measured by the deflection of a galvanometer. This galvanometer should be a pivoted instrument, of good working qualities, and should have a sensibility such that one division of its scale corresponds to say one-tenth to one-fifth of a scale division of a voltmeter of the same maximum range as the potentiometer. This gives great ease of reading, as it is usually sufficient to read the galvanometer to the nearest division, neglecting tenths. These requirements indicate a deflection potentiometer, and as a number of variations are possible, in the arrangement of circuits for such an instrument, these various plans have been examined with a view of determining the one which is the most suitable. The plan adopted has many practical points of advantage in construction and operation. The volt-box resistance is high and constant; the resistance of the galvanometer circuit is constant, and the galvanometer may thus be critically damped at all settings. The steps on the main dial are equal resistances, and by suitable design may also be made even values, which facilitates checking and adjusting. Multiple ranges are readily provided, and if it is desired to measure pressures in excess of the highest for which the instrument is built, this may be done by the use of an external multiplier, giving a very small but constant percentage correction to the deflection reading.

It is desirable that the standard instrument be semi-portable, for while such an instrument is commonly used in one place, it is often necessary to make precision measurements in other places on relatively short notice. In the case of the deflection potentiometer, by building the pivoted galvanometer in as a part of the apparatus, the only accessories are the storage battery and the standard cell; the former must be carried separately, and preferably the latter also.

An instrument has been designed in accordance with the above-mentioned plan, for use in voltmeter testing in the Bureau of Standards. A diagrammatic plan of connections is given in Fig. 1.

The main dial has 25 steps of 100 ohms each. This is in series with a coil of 9.4 ohms and a dial of 10 steps of .05 ohm each. The Weston standard cell is balanced around 509.4 ohms plus the amount on the dial, and as the standard current is .002 ampere, cells of 1.0188 to 1.0198 volts may be used, and if need be, this range may be varied by changing the 9.4 ohm coil. In the storage cell circuit is a series rheostat whose minimum resistance is 297.5 ohms, increasing from this value in 15 steps of 1.5 ohms each. At the same time that the series resistance is increased, a resistance in shunt to the potentiometer wire decreases from a maximum of 6814 ohms to a minimum of 2667.5 ohms. A fine rheostat of 11 ohms in the battery circuit covers any step of the coarse rheostat, and has a compensating resistance of 7.5 ohms maximum in the galvanometer circuit.

The drop is taken from the ends of a 500-ohm coil, which is in series with 12,000 ohms when the range switch is set on $\times 1$. When this switch is at $\times 2$ and $\times 5$ the total resistance between the e. m. f. posts is 25,000 and 62,500 ohms, respectively. All of these coils, except the first 500 ohms, are mounted within and well insulated from a brass box which entirely encloses them. The negative e. m. f. terminal post is inside of, and well insulated from, a brass sleeve which projects into the box and is soldered to it. This box is connected by a wire to the positive e. m. f. post, and acts as a "guard wire" to prevent leakage currents from flowing through the circuits of the potentiometer proper. This is a very important precaution, which will be appreciated when we consider the high pressure (625 volts) available for producing leakage, and the fact that the full deflection of the galvanometer is produced by .00006 ampere, a current which 625 volts would send through a resistance of over 10 megohms; while a current sufficient to give a readable deflection would flow, under this pressure, through

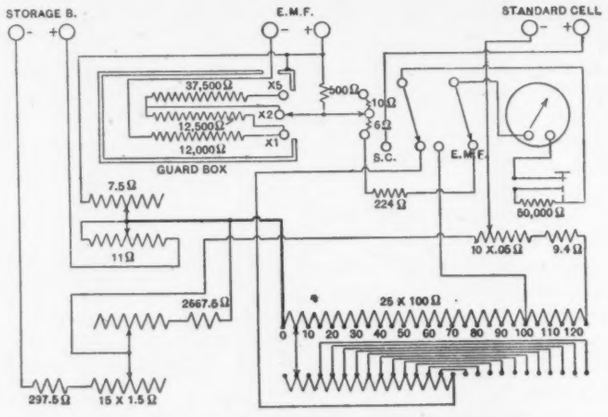


FIG. I.—DIAGRAM OF POTENTIOMETER CONNECTIONS.

3000 megohms. With the arrangement shown, the maximum pressure which may produce leakage through the galvanometer is 6 volts.

The main dial has a set of compensating coils for keeping constant the resistance between the sliding contact and the 0 end of this dial. By arranging the resistances of the series and the shunt rheostat and the standard cell coils so that the resultant resistance beyond the 125 end of the dial is 300 ohms, the total resistance in the storage battery circuit being 2800 ohms, the point of maximum resultant resistance to the galvanometer current will come at the setting 70; the resistance at 75 will be the same as at 65, and so on. Hence compensating coils are used up to the point 70, and by the use of cross-connections no additional coils are needed beyond this point.

A double-pole double-throw switch is used to change from standard cell to e. m. f., and a push button is provided in the galvanometer circuit. This button operates a double successive contact key having a protective resistance of 50,000 ohms in the first contact. The fine adjustment rheostat consists of two semi-circular coils of insulated wire, the insulation being removed on the face to allow the sliding brush to make contact

While the lowest range provided is nominally 0 to 125 volts, the range 0 to 5 volts may be had by using as the — e. m. f. terminal the lever of the range switch, and adding sufficient resistance to the galvanometer circuit to make the proper total. In other words, the normal range of the potentiometer is from

[1] Abstract of a more detailed paper to appear in a forthcoming number of the *Bulletin* of the Bureau of Standards.

[2] *Bulletin* of the Bureau of Standards, Vol. 2, p. 225, 1906; abstracted in Electrical World, Vol. 47, p. 564, 1906.

0 to 5 volts, readable to .0004 volt (one-tenth of a scale division of the galvanometer). This range may be increased as desired by adding resistance in the e. m. f. circuit at the rate of 100 ohms per volt. The reason for not making the lower ranges immediately available by setting the range switch is the danger of accident to these low ranges, due to the inadvertent application of the usual working pressures of 100 volts and over. The lower ranges are not frequently required, and may be arranged for specially as above described. It is proposed to construct an external rheostat which may be quickly connected up to give the ranges 0 to 12.5, 0 to 25, and 0 to 62.5 volts, the proper compensating resistances being thrown into the galvanometer circuit for each range. The presence of this special accessory apparatus would constitute an indication of the need for caution as to the value of the voltage to be applied.

A view of the instrument is shown in Fig. 2, from which it will be seen that the galvanometer is built into the rubber top,

FIG. 2.—GENERAL VIEW OF POTENTIOMETER.

making the apparatus self-contained with the exception of the cells. The scale of the galvanometer is shown in Fig. 3.

It has two sets of figures; an upper with 0 in the center, and a lower with 5 in the center. Ten divisions of this scale correspond to one volt, the upper set of figures being used when the dial reading ends in 0, the lower set when it ends in 5. Thus, if the dial reads 110 and the galvanometer needle stands at 22 divisions to the right, the e. m. f. to be measured is $110 + 2.2 = 112.2$ volts. In practice, the dial reading is set at the center of the galvanometer scale, using upper or lower figures as required, when the value of the voltage can be read off from the scale, reading directly to tenths of a volt and estimating hundredths. The above applies to the first or principal range; when the range switch is at $\times 2$ or $\times 5$ the operation of the instrument is exactly the same, but the values are to be multiplied by 2 or 5, giving a maximum range of 625 volts. Should

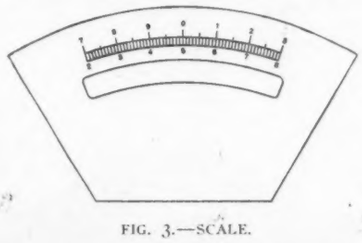


FIG. 3.—SCALE.

it be necessary to extend this by using a multiplier, this may be done with an error less than 0.2 per cent of the deflection portion of the reading. At full scale deflection this is about .05 division, or about the limit of setting the needle on a line. Hence, in this design, multipliers introduce a negligible error.

This instrument was built by the Leeds & Northrup Company, of Philadelphia, Pa., the galvanometer being supplied by the Weston Electrical Instrument Company, of Newark, N. J. It is so rapid and dead-beat in operation that the only limit to the rapidity of testing voltmeters with it is the ability of the operator to control the voltage and read the voltmeter under test. The appliances now in use at the bureau for voltage control will be replaced soon by others, which will give the maximum speed of working.

While intended primarily for direct-current testing, the new instrument will be of assistance in testing alternating-current voltmeters. This is done by the use of a transfer instrument which is equally correct on direct and alternating current; the transfer instrument, the potentiometer and the voltmeter to be tested being connected in parallel with each other, first on alternating, then on direct e. m. f. The change from alternating to direct voltage is accomplished by a quick-acting snap switch, the circuit being broken for so short a time that the deflection of the transfer instrument is maintained. This results in a saving of time, and the avoidance of zero errors, and is a very accurate and convenient method.

A test of this potentiometer in comparison with a five-dial standard potentiometer showed very small errors, which are entirely negligible in voltmeter testing, and which may be allowed for when the instrument is used for work of greater precision.

In this and in the preceding article stress has been laid upon the desirability of using a pivoted portable form of galvanometer. This has been done because the aim has been to produce instruments that can be quickly and conveniently operated and moved from one place to another without requiring the special setting up which is necessary with reflecting galvanometers having delicate suspensions and small clearance between coil and pole pieces. Any galvanometer can be used which has a good zero and a constant that is reasonably permanent. It is desirable, if a reflecting galvanometer is to be used, to employ a taut suspension above and below, heavy enough to give quick working and good zero. For a given set of conditions the sensibility required can be determined, and the suspensions can then be chosen to give this sensibility. The matter of critical damping should be taken into account, as before mentioned.

In the case of a deflection potentiometer for current measurements in connection with suitable shunts, which might have, say, 150 millivolts as the upper limit of its range, the small amount of power available imposes much greater requirements upon the galvanometer than in the case of an instrument for the measurement of voltage, such as the one above described. The design of such a potentiometer for current measurements has been begun.

While the potentiometer for voltage measurements, as described in this article, is best adapted to laboratory use, where voltmeters of various ranges must be tested, a simpler and less expensive instrument would answer all requirements in central station work. For example, a range of 105 to 125 volts, with provision to double and quintuple the range, would cover the most important requirements of the light and power station. The sensibility in this case would not need to be as great as for the laboratory instrument, so that a less sensitive galvanometer would be satsifactory. Preliminary work on the design of such an instrument has been begun.

Single-Phase Equipment of the Windsor, Essex & Lake Shore Rapid Railway.

The first company to adopt single-phase railway equipment in Canada was the Windsor, Essex & Lake Shore Rapid Railway Company, which is at present using single-phase cars between Windsor and Kingsville, Ontario, a distance of 28 miles. The single-phase system is now being extended from Kingsville to Ludmington, a distance of 9 miles.

The company is now carrying express as well as passengers, and is planning to carry freight. The cars were built for interurban traffic by the Ottawa Car Company. At present the equipment includes five motor-cars, four passenger trailers and two trailers for express. The trailers are not regularly used and not more than one is drawn by a single motor car. There are on each motor-car two 100-hp Westinghouse single-phase series motors. These motors are provided with compensating field coils for neutralizing the armature reactance. The regular Westinghouse pantagraph is used on the cars. It is raised by means of springs under tension and is pulled down by a trolley

rope. The motor-cars are provided with air-brakes, and two cars are now being equipped with air-operated pantagraphs. The air compressor is driven by a 3.3-hp, single-phase, 100-volt motor.

A complete diagram of the wiring of the cars is shown herewith. It will be noticed that provisions have been made to take energy from the wire both at 1100 volts and at 6600 volts. Only one of these voltages, however, is used, although when the equipment was bought it was intended to use 1100 volts in the city of Windsor, and to supply energy at 6600 volts for the rest of the line. As permission was granted to use the higher voltage at Windsor, a change-over switch is no longer necessary and only one lead to the auto transformer is used. If the necessity should ever arise, 1100 volts can be used at any point without altering the car equipment.

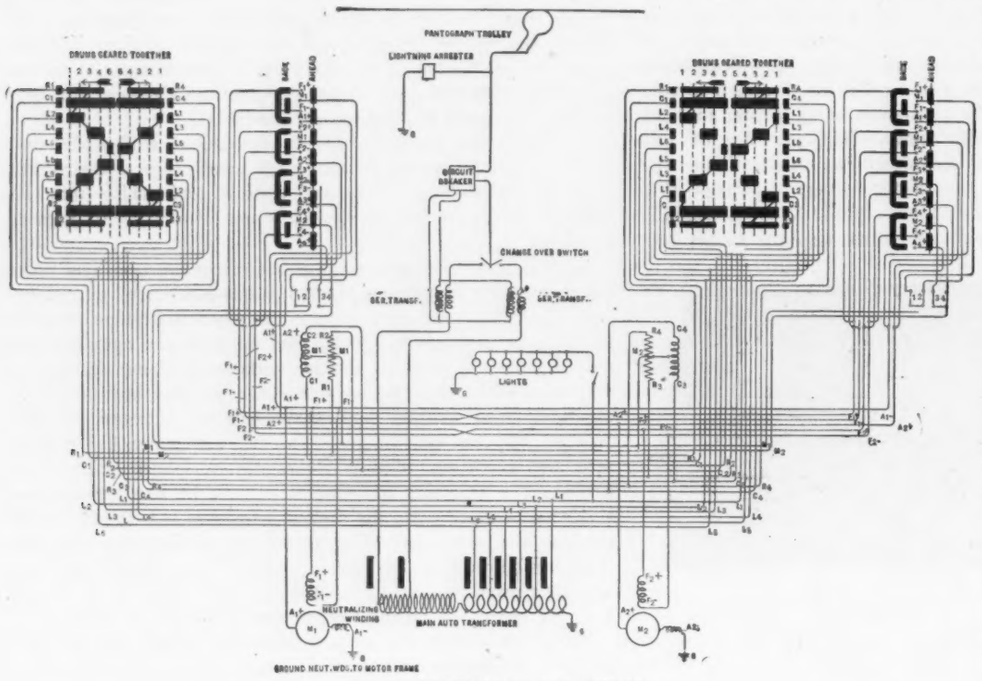


FIG. I.—DIAGRAM OF CAR WIRING.

The connection from the pantagraph to the circuit-breaker is made with lead-sheathed, rubber-insulated cable. The resistance coils, *R* and *C*, are connected between the controller segments and the armature to minimize sparking at the controller. The auto-transformer is of the oil-insulated, self-cooled type, rated at 100 kilowatts; there is one to each car.

The contact line is of catenary construction, with poles set 120 ft. apart on the tangents and as close as 80 ft. on the curves. Bracket construction on the poles is used exclusively, except where the line passes through towns. The trolley wire used is 000 grooved. The hangers from the messenger wire to the trolley wire are spaced 10 ft. apart. Where the bracket construction is used, the messenger wire rests in the groove of the insulator, which is fastened to the T-bracket arm. The hangers cause the trolley wire to remain below the arm, and no further insulating devices are necessary on these poles, except where there is a lateral strain on the wire. Where this is the case, and on all curves where brackets exist, a steady strain device of the wooden-arm type is used. The porcelain insulator holding the steady-strain rod is carried in a malleable iron yoke which is adjustable on the bracket arm. The steady-strain rod is made of a thoroughly impregnated wooden rod having malleable iron end-lugs. This is used instead of a sleeve type in order to bring the trolley wire closer to the bracket arm. In addition to using these on curves, they are located at 12-pole intervals on the tangents.

Since the messenger and the trolley wire are both electrically connected, at each section break, it is necessary to open the circuit on both of these conductors. The messenger wire is cut at the point of the change of circuit, and the ends are fastened to separate wire insulators, the insulators being suspended from the insulator arm of the bracket. To open the circuit upon the trolley wire, a piece of second-growth hickory, treated to make it moisture-proof, is introduced into the line. The ends of this block are provided with terminals into which the ends of the trolley wire are fastened, the construction of the terminals and the shape of the wooden bar being such that the trolley passes smoothly from one circuit to the other across the intervening space without leaving the line. The arc is broken on the terminal casting. Line section-insulators are used at the sub-station, one at Kingsville, near the car shed. The latter insulator allows all the wires in the yard to be connected or disconnected without interfering with the rest of the line. A separate switch for controlling the yard circuits is installed in the power house. It is found that the men can work with perfect safety from a repair tower even when the voltage is on the line, by using a platform mounted on four double-skirt insulators, such as are employed on the poles for span-wire construction. The cross-span construction is of the steady-strain skirt type. In this type of construction the only insulators ordinarily used are those on the poles, the span wires being connected to the trolley at all times. In the present installation there was inserted in the span wires, at a distance of 3 ft. from the catenary structure, a wood strain-insulator, which makes the span-wire "dead" except for 3 ft. on each side of the trolley wire.

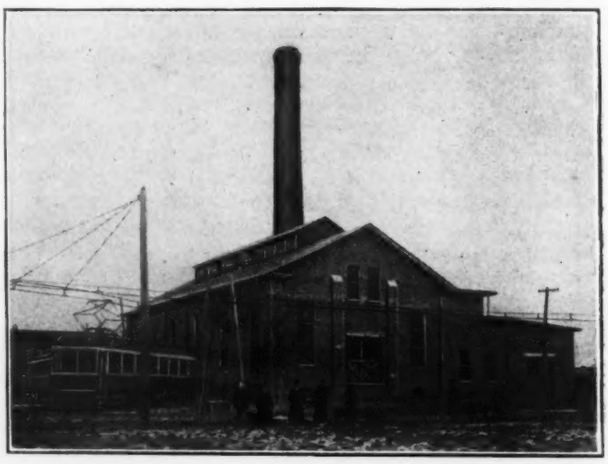


FIG. 2.—TROLLEY WIRE AT POWER HOUSE AND CAR SHED.

The poles in the city of Windsor have been made of concrete. Each is required to withstand a horizontal strain at the top of 1000 lbs.

The catenary structure conveys all of the energy used as far as the sub-station at Mirdstone, a distance of 18 miles, at 6600 volts. At this point there is installed an auto-transformer, which receives energy from the power house over a special

transmission wire at 13,200 volts and reduces the e. m. f. to 6600 volts. The transmission line is supported on the same poles with the trolley wires, except in a few instances where it is placed on a special line of poles on account of trees. A diagram of the wiring of the sub-station is shown in the right-hand lower corner of the switchboard diagram. The transformer is rated at 300 kilowatts; it is oil-insulated and self-cooled.

The power house is located at Kingsville by Lake Erie, from

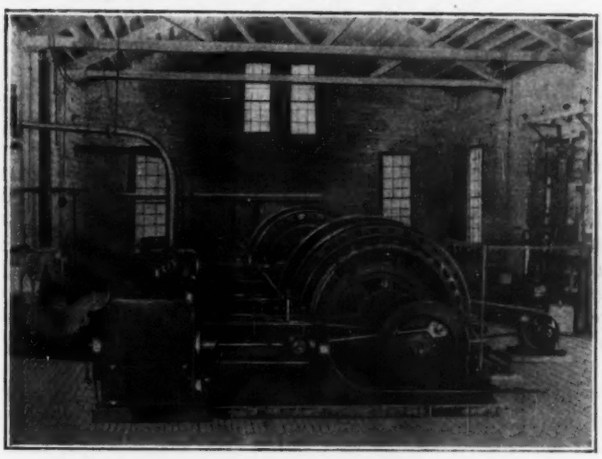


FIG. 3.—ENGINE ROOM.

which water for the condensers is pumped. The main part of the building, which is the engine room, is of brick. The walls of the boiler room and the division wall between the boiler room and engine room are made of concrete blocks. The chimney, which was built by the Alfonse Custodic Chimney Company, is of radial brick.

There are two Goldie-Corliss cross-compound engines, 20 ins. x 40 ins. x 36 ins., manufactured by the Goldie & McCulloch Company, of Galt, Ont. These engines are provided with steam-actuated dash pots, and have separate eccentrics for the steam and exhaust valves. The speed is 125 r. p. m. The governor is belted to a pulley on the main shaft and is similar in action to a flywheel-type governor. The generators are 500-kw, 25-cycle, single-phase, Westinghouse machines, direct-connected to the engines. The exciters are 30-kw machines belted to the main engines. Space is left for one more complete unit similar to the above in the engine room.

The condensers, boilers and piping were manufactured and installed by the Canada Foundry Company. There is one jet condenser for each engine, size 16 ins. x 24 ins. x 24 ins. The injection water, as previously mentioned, is piped from Lake Erie, through two 10-in. pipes.

One condenser has a lift of 22 ft. and the other 19 ft. The distance from the power house to the end of the intake pipe is 500 ft. The end of the pipe was placed 100 ft. from the foot valve in order to obtain good, clear water. The pipes are attached to the side of a pier with bolts. In order to keep stocks and such matter from getting into the pipes an extra piece 3 ft. long with a cap was screwed on the end, and the pipe as well as the cap was perforated with ½-in. holes.

The horizontal pipe from the foot valves to the end was set 2 ft. below the average level of the lake to insure getting water when the lake at this point became low, as is frequently the case during north-west winds. In order to get the pipe down to this depth it was necessary to dig a trench for about 75 ft. under water, which is very shallow near the shore. This work was done in the winter, a scoop scraper, pulled by horses being used, and the men holding the scraper walking on the ice. The foot valve was kept down at the same depth as this pipe, thus insuring its always being under water. A manhole was built around the foot valve from which the water can be pumped, should any repairs here be required.

The two condensers feed into a common hot-well, the overflow from which discharges into a 14-in. pipe back to the lake.

In the boiler room there are four 360-hp Canada Foundry Company water-tube boilers, and there is room for two more. There are two Cochrane feed-water heaters supplied with water from the hot well by a 10 in. x 6 in. x 10 in. Blake duplex pump, and these heaters are supplied with the automatic attachment for regulating the feed from the hot well by placing this pump in and out of service as the water is needed.

The boiler feed pump is a Canada Foundry Duplex, size 7½ ins. x 4½ ins. x 10 ins.

It is now being arranged to use natural gas, and under one battery of boilers is being installed 26 5-in. Gwynne burners manufactured by Reinecke Wilson & Co., Pittsburg. These are to receive oil through a 6-in. supply pipe at a pressure of 10 oz. per square inch. The other battery of two boilers will not be equipped until these prove satisfactory. The grates used are the cyclone grates made by the Canadian Steam Boiler Equipment Company, Toronto.

There is a gravity oiling system, with oil separator, filter and steam operated pump, purchased from the Pittsburg Oil Gauge & Supply Company. The plant was run for a little over a month and a half non-condensing, as this part of the work was not finished.

It may be interesting to state the comparative costs per hp-hour running with and without the condenser. Up to the time the condenser was put in service (Nov. 19, 1907) the average cost of operating the plant was 1.155 cents per hp-hour. From Nov. 19 to Nov. 30, the cost was .708 cent. These figures are given only to show a comparison between running condensing and non-condesing, and do not represent what will be done

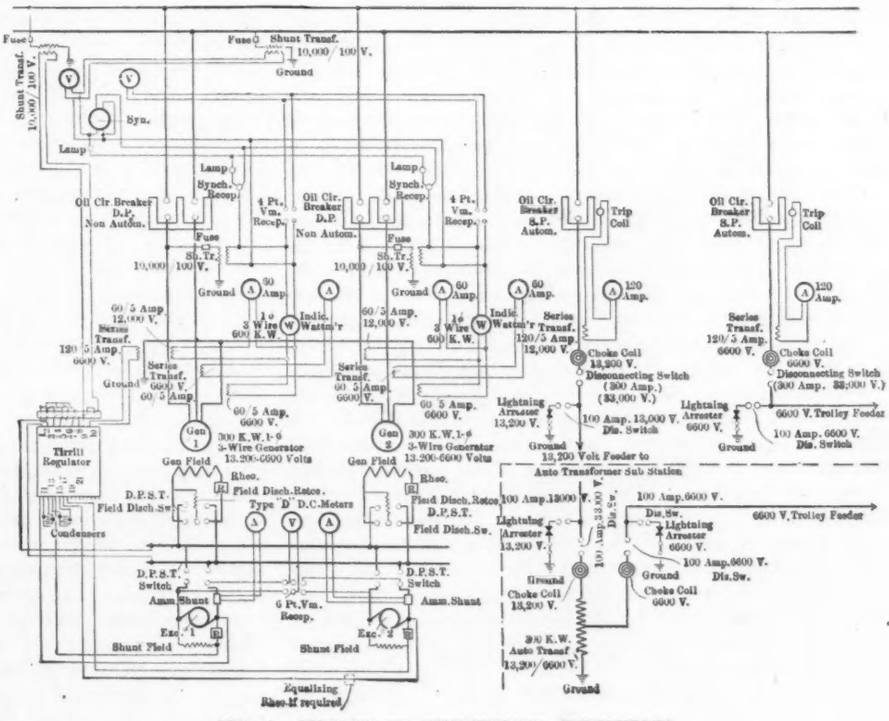


FIG. 4.—DIAGRAM OF SWITCHBOARD CONNECTIONS.

under better conditions. The steam pipes have not yet been covered and the average load is a little under 50 per cent of the full rating of the machines.

In the switchboard arrangement there are three wires from the stationary armature of each generator—one ground wire, one carrying energy at 6600 volts and the other at 13,200. Both of the latter wires are lead-sheathed, rubber-insulated cables, and are run to the switchboard in fibre conduit. This conduit is designed to withstand over 34,000 volts on a puncture test. A Tirrell voltage regulator is used. The resistance coils and potential transformers are located in the basement of the building directly below the switchboard apparatus.

Each feeder wire enters the building through two glass plates set in 10-in. glazed tile. Both outside and inside the building the wires are fastened to insulators supported on a bracket structure made of 3-in. angle irons bolted together. The lightning arresters, disconnecting switches and auxiliary apparatus are mounted on an oak framework well shellacked. The same method is used for incoming wires, lightning arresters, etc., at the sub-station.

The road is now in successful operation and the construction work is being pushed towards Leamington as rapidly as possible. The line operates through a very prosperous district and promises to prove a good investment. We are indebted to Mr. S. C. DeWitt, electrical engineer of the Windsor, Essex & Lake Shore Rapid Railway Company, for the information contained in the above description.

Street Lighting and New Illuminants.

By Dr. Louis Bell.

THE commonest fault in street lighting is lack of light. The average street in town or city is illuminated only in spots owing to unduly wide spacing of the lamps whether arc or incandescent, and at the point midway between lamps blackness reigns supreme. The strong light near the lamps is not at all without value since the protection afforded against night prowlers depends quite as much on the illumination of dooryards and alleys as upon that on the sidewalk, but save in rare instances the minimum illumination is far too low. It frequently falls to less than .01 foot-candle, whereas, to afford the equivalent of even dim moonlight, it should be at least twice this figure.

The cause of this insufficiency is not far to seek. It proceeds primarily from frugality, not to say parsimony, on the part of the authorities—a quality sometimes stimulated by the fact that no one has any acute pecuniary interest in good lighting save the lighting company, whose enthusiasm is not regarded as altogether altruistic. In matters of paving or grading or sewerage, which furnish opportunities for thrifty wardsmen, there is far greater alacrity in promoting civic improvements.

Secondarily, in the early days of electric lighting the prices charged were undoubtedly high, so high as to put illumination into the category of luxuries. As time has gone on prices have been materially reduced, but even now if one considers merely the care of the lamps and the energy required, street lighting looks like a pretty profitable proposition. The thing which the public forgets is that as lamps are usually spaced the distribution costs of street lighting are exceptionally high. One gets up to 30 or 40 miles of circuit in surprisingly small places, and this circuit is more difficult to maintain than any other class of distribution. If street lamps were spaced closely enough to give proper illumination upon the streets the cost of distribution per lamp would be enough reduced to justify a decrease of price.

In spite of this difficulty, the tendency of lighting prices is downwards and some lighting companies now deliberately pursue the policy of doing public lighting on a rather modest margin of profit. Nevertheless, it is rare to find street lamps spaced near enough to give really good illumination, and the tendency in improvement is to use more powerful lamps at the old spacing. Right here is where some of the new illuminants are going to prove extremely useful in virtue of giving considerably more light for the same money.

There is in fact a good deal of humbug about "subdivision" and "distribution" of street lamps. That they should be so distributed that the minimum illumination should be at the very least double the usual figure admits of little doubt, but how far it pays to make this gain at the expense of the average illumination is another question.

A street lighted on the basis of the minimum value alone would generally be very badly lighted. A minimum of .01 foot-candle, for instance, could be met by common candles spaced 20 ft. or so apart along the curb, but the result would be easier to imagine than adequately to describe. The protective value of lighting depends on brilliancy over as much of the street as possible and a specification of minimum intensity neglects this very important matter. An occasional old street illuminated dimly by single gas flames is a case in point. There is good reason, therefore, in bringing up the minimum by increasing the power of the radiants, although it would often be wise to decrease the spacing as well. To secure a proper minimum of say not less than .03 foot-candle on a street, requires more than double the amount of light generally used at present, coupled with closer spacing.

Fortunately the greatly increased efficiency of some of the recent illuminants enables the necessary increase to be gained by a rather moderate increase of cost. They beat the old arcs and incandescents almost as the Welsbach beats the open gas flame. It must not be supposed, however, that the gain is without its penalties. Could the Welsbach be kept up to its laboratory standard on the street, it would be a very formidable competitor, but experience shows that, necessarily open to access of air, it soon accumulates dirt and deteriorates so that its average condition is bad.

In similar fashion, some of the new arcs have idiosyncracies that so far have tended to delay their introduction. The flaming yellow arc, for example, requires frequent trimming, with rather expensive electrodes. Its distribution of light is rather downward than outward, so that it fails to throw its strongest rays out along the street. Nevertheless, it is tremendously effective in lighting large open spaces when hung rather high, and with increasing use the cost of supplies will come within reasonable bounds, so that it, or some near derivative of it, is bound to be a valuable adjunct where great brilliancy is desired. Anyone who has seen it pour its flood of light deep down into the excavation for a new building turns away with a profound respect for its prowess. There is no adequate reason for the present high cost of the special carbons, and when this is properly reduced the cost of trimming will cease to be the bug-a-boo that it is at present. After all the labor cost of trimming even the old open arcs was a comparatively small item, and when one is dealing with an arc that gives nearly five candle-power per watt, one can afford to trim frequently.

The so-called luminous arc, whether of the magnetite or titanium variety, presents a different set of conditions. Its distribution being outward instead of downward, it is especially well fitted for street work. There will be, however, in its use a rather strong temptation to rely too much upon its capacity for raising the minimum illumination between lamps, at the expense and to the detriment of the average illumination. The best results would be obtainable by spacing these new and efficient lamps with reference to preserving a high average and letting the minimum take care of itself. The result would be a minimum high enough to really be of some use for the first time in the history of American street lighting. These luminous arcs are not without some inherent troubles of their own, not yet fully taken care of. They produce a smudge of oxides difficult to keep out of mischief, and to bring this within practicable limits it has so far been necessary to work with very small currents in the arc. An arc system with, say, three amperes as its standard current is naturally hypersensitive to grounds, and the arc lacks the stability of one carrying the usual current of the systems now in use. The control of these

difficulties is the crucial point in the commercial use of these otherwise very promising arcs, and the reports thus far are rather encouraging. The gain in energy consumption is very considerable and should be in part applied to increase in the number or power of lamps in order to secure the better lighting, which is sadly needed.

A still more promising innovation is the application of the tungsten filament to series incandescent lamps for street service. With a specific consumption of little over a watt per candle-power, the series tungsten lamps give more than double the effective candle-power of carbon-filament lamps taking the same energy. Something of this gain must be set over against the increased cost of lamps, but the net result should be a very considerable increase in both minimum and average illumination on the streets, the distribution of the new lamp being practically the same as that of the old. It certainly would not be desirable to use fewer lamps on account of their increased candle-power.

The relative value of arc and incandescent lamps for street lighting is a moot question. The smaller units obviously give the more even lighting, but generally a much lower average illumination than the arcs, and as already intimated the value of brilliancy, especially in the more densely populated parts of a city, has been of late too much overlooked. In comparatively open country, where the lamps are really markers along the road, and in densely shaded streets where arcs if hung low enough to be of much use shine directly into the eyes, there is much to be said for the incandescent lamp.

With respect to the tungsten lamp, it should be noted that its useful life is much longer than that of the carbon lamp. It occasionally blackens early in its career, but, on the whole, its candle-power stays well up to its initial value till near the end of its life, which seems to be at least double that of a carbon lamp, unless the latter is burned until long past usefulness. A street lighted with tungsten lamps will certainly show not only much higher illumination for the same energy, but considerably greater freedom from dim lamps than if carbon lamps were used.

At present tungsten lamps must be burned with the tip down and the axis very nearly vertical, which is, however, no material objection. Series incandescent lamps do not give a large end-on candle-power, and light the street quite as well with axis vertical as when inclined. In the latter position the zone of maximum light is in great measure wasted by being turned up into the tree tops instead of being in a plane nearly parallel to the surface of the street. The amount of light wasted on the sky in ordinary street lighting is very striking when one gets the distant view of a city at night.

Evidently the next few years are going to make a considerable change for the better in street lighting. The thing which the writer desires particularly to impress is the need of applying the gains in efficiency to increase of both the average and the minimum illumination, and not in the interest of petty economy to throw away the chance for better lighting. However desirable it might be to return to the simple life and going to bed at nightfall, the fact is that cities are steadily growing more nearly nocturnal in habits and must, therefore, require increasing brilliancy of illumination. It is fortunate that recent improvements enable it readily to be supplied.

New Telephone Patents.

ANTISEPTIC DEVICE.

It is probably safe to say that there have been developed hundreds of ideas for antiseptic devices for telephone instruments. Most of these, of course, are for application to the transmitter. However, there are also a considerable number for use with the receiver. Probably the most prolific type is that in which a sheet of paper adapted for ready renewal is stretched across the instrument opening. Others provide a holder for an absorbent which may be saturated with antiseptic solution, and still a third class embraces a reservoir for the antiseptic itself. In this last class is the device just patented by C. J. Printz, of Milwaukee. A double-walled annulus is formed up of sheet metal, exposed edges being at the aperture. In doubling over the metal to form the periphery of the annulus, the metal walls are so shaped that at the outer edge they are some distance apart, while at the hole they are close together leaving merely a slit between them. This receptacle is clamped between the shoulder of the mouthpiece and the transmitter face. Small holes are drilled in the mouthpiece to register with the slit, and also in the transmitter case, to provide for circulation. A mouth and stopper provide a means of introducing the antiseptic solution.

TRANSMITTERS.

In Fig. 1 is shown a sectional view of a double-acting transmitter. The casing affords a channel for the sound waves to

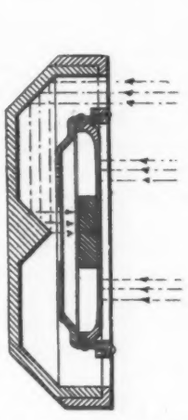


FIG. 1.—HAFF TRANSMITTER.

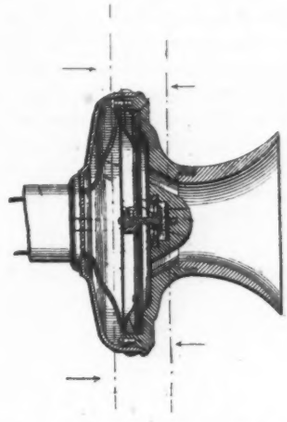


FIG. 2.—HANSEN TRANSMITTER.

the main diaphragm, which is located within the instrument. The second diaphragm is heavier and closes the mouth of the cup. The inventor is H. W. Haff, of New York City, and he has assigned his patent to the General Accoustic Company.

Rather a novelty in the transmitter line is the instrument shown in section in Fig. 2, this the invention of R. Hansen, of Chicago. It will be seen that the front plate is thickened, so that its middle part forms a receptacle for the microphone button. This latter is similar in design to that of the "solid back" transmitter. The figure indicates most clearly the arrangement.

Transmitters have been so long universally of the microphone type, *i. e.*, of that type where a difference of pressure at the contact point of two solids effects a resistance change, that one scarcely looks for the adaptation of any other principle. However, E. E. Ries, of New York City, has just received a patent for a liquid transmitter. His is not like the old Gray arrangement, wherein the vibrating diaphragm varied the depth to which

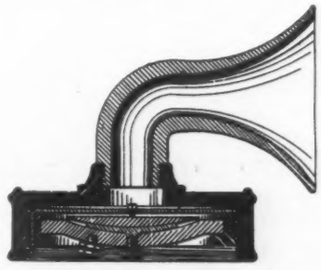


FIG. 3.—RIES TRANSMITTER.

one electrode dipped into the liquid, but the inventor varies the area of contact of the liquid with the electrodes.

Fig. 3 will serve to show the arrangement. As the electrodes approach, capillary attraction will cause a great increase in the area of contact of the liquid, if there be a reservoir connected to supply liquid. Of course, there is a diminution of the thickness of the film, but by properly shaping the electrodes this can be made small compared to the increase of area of contact.

Letters to the Editors.

Turbine Tests.

To the Editors of Electrical World:

Sirs:—I have seen a letter of Mr. J. R. Bibbins in your issue of Dec. 14 and other correspondence in your columns concerning tests of a 7500-kw Parsons turbine at the Waterside Station of the New York Edison Company compared with reported performances of one of the 8000-kw Curtis turbines in Chicago. In reducing the reported results to the same conditions, Mr. Bibbins applies certain corrections in the case of the Curtis machine which he says are advocated by its builders. The correction thus arrived at is not correct, and I desire to put this comparison in correct form on the basis of existing published data.

In the case of the Curtis machine tested in Chicago, it is necessary to make no assumption concerning correction factors. This machine was tested daily for nearly a month by Prof. L. P. Breckenridge, of the University of Illinois, and Prof. Storm Bull, of the University of Wisconsin. During this time all conditions of load, initial pressure, vacuum, and superheat were thoroughly investigated and curves were drawn from which results for almost any condition can be taken without appreciable correction.

The accompanying curve sheets give load water rate curves of this 8000-kw machine taken from the curves in the report and in comparison show, first, the results of the New York Edison test reduced to similar conditions; and, second, the results of the test of a similar Parsons machine, made in the Manhattan Station of the Interborough Rapid Transit Company, and published in the *Electric Journal* for July, 1907.

The report of the New York Edison test in question was published in the Electrical World of Oct. 12, 1907, and in this report, rates of correction were given for variations of

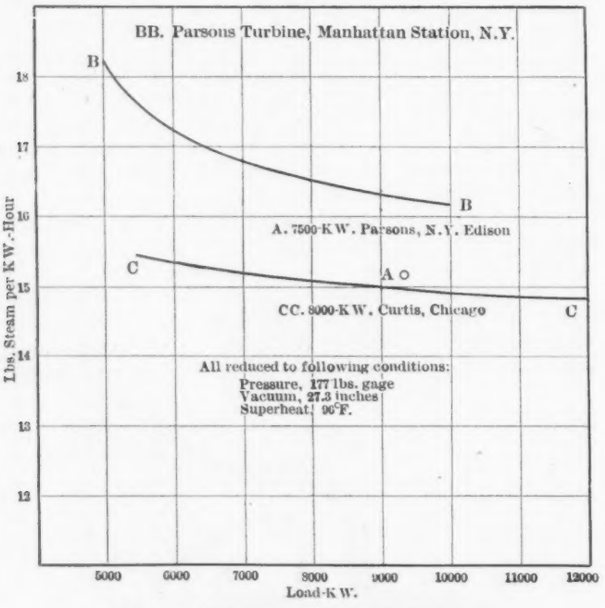


FIG. I.—COMPARISON OF TURBINE TESTS.

Point A.—Test of N. Y. Edison Parsons turbine, as taken from *Electrical World*, Oct. 12, 1907.
Curve BB.—Derived from tests published in *Electric Journal* of July, 1907; results reduced to conditions of N. Y. Edison tests by constants published in connection with that test in *Electrical World*, Oct. 12, 1907.
Curve CC.—Taken from test curves made by Prof. Storm Bull and Prof. L. P. Breckenridge in February, 1907.

vacuum, initial pressure, and superheat. These rates I have used in making the comparisons shown by the accompanying curves.

Fig. 1 shows the actual result reported in the New York test of the 7500-kw Parsons turbine, and above it the result of the test of the Parsons turbine in the Manhattan Station reduced to the same conditions by the constants mentioned above; and in comparison is shown the performance of the Curtis turbine in Chicago, under the same conditions, taken from the test reports without appreciable correction.

Fig. 2 shows the same performances of the Parsons turbines reduced by the constants above mentioned to conditions which fairly represent the average of daily service under which the Chicago machine operates. In this case also the performance

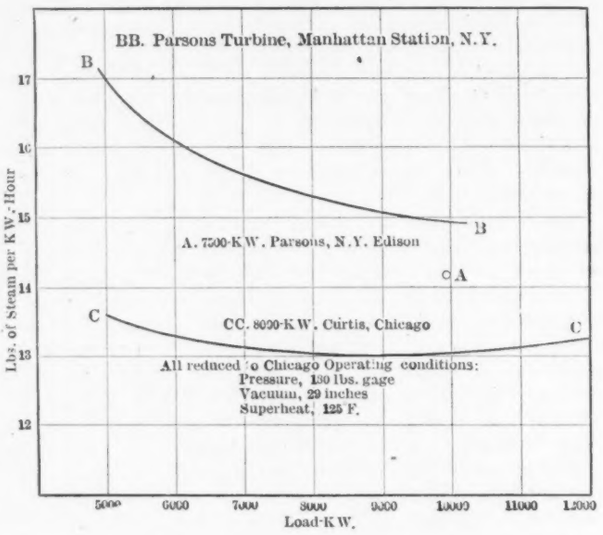


FIG. 2.—COMPARISON OF TURBINE TESTS.

Point A.—Result of N. Y. Edison test corrected to regular operating conditions of Chicago turbines by constants given in the test report, *Electrical World*, Oct. 12, 1907.
Curve BB.—Test of Parsons turbine in Manhattan station of the Interborough Rapid Transit Company, New York, published in the *Electric Journal* of July, 1907; results corrected to Chicago operating conditions by the same constants as point A.
Curve CC.—Taken from test curves made by Prof. Storm Bull and Prof. L. P. Breckenridge in February, 1907.

of the Curtis machine is taken from actual test reports without the necessity of appreciable correction.

This latter comparison illustrates very clearly the superiority of the Curtis turbine under conditions of high vacuum, and shows also the large gains which good vacuum affords in a machine designed to use it.

There is good reason to believe that these comparisons do more than justice to the Parsons machines, first, because the corrections made give credit for considerable improvements on account of increase of initial pressure, though such improvement cannot be appreciable in a machine which governs by virtual throttling; and, second, because the rate of improvement for vacuum, while probably correct for a range between 27 ins. and 28 ins., is presumably too large for correction to 29 ins.

The reason for the large difference in the performances of these two Parsons machines has not been explained, and it has been generally understood that the turbine parts of the two machines are practically identical. It would seem probable that one of the tests is incorrect, or else the New York Edison test was run with a closer adjustment of leakage clearance around balancing rings.

In the end of his letter, Mr. Bibbins deprecates the cultivation of extreme operating conditions in turbine plants, and in this presumably refers to the use of high vacuum. Increased vacuum affords very great increase of available energy, and with a turbine which does not leak air, involves in most cases little additional expense. Since a properly designed Curtis turbine affords high efficiency to extreme vacuum ranges, it is folly to use low vacuum where high vacuum can be produced. In many large plants where Curtis turbines are used, a vacuum of 29 ins. or over is carried almost throughout the year. In the Chicago plant, where the above-mentioned tests were made, the vacuum generally exceeds 29 ins., and sometimes reaches

29½ ins. The auxiliaries in this station involve a loss of 0.7 per cent.

The greatest advantage of the turbine over the reciprocating engine lies in the fact that it is efficient in the lower ranges. In reciprocating engines we gain only about 20 per cent by condensing, as compared with non-condensing conditions, while in a properly designed turbine we gain 100 per cent. It is certainly not good engineering to throw away these advantages by binding ourselves to vacuum conditions which have prevailed in reciprocating engine practice, where increase of vacuum affords no important improvement.

SCHENECTADY, N. Y. W. L. R. EMMET.

The Rolling of Thunder.

To the Editors of Electrical World:

SIRS:—I have read with interest Mr. Carpenter's article on "The Rolling of Thunder" in your issue of Dec. 21. I note also your editorial comments upon the same.

In your editorial you refer to reverberations reflected from earth and sky, while Mr. Carpenter may fairly be presumed to have included the same idea in his closing sentence. It seems to the writer that these phenomena are as prolific in producing the rolling of thunder as any others, but this fact should not distract the attention from the possibilities exposed in the valuable article referred to. With these remarks in mind the following account of a sun shower on the shores of Lake Minnetonka, about three years ago, is ventured:

There was a small rain-cloud overhead, from which a shower was being precipitated intermittently. There was considerable blue sky, with several other rain-clouds in various directions, one of which was near by, over the lake. From the cloud overhead there came several sharp flashes at intervals of 20 or 30 seconds. In each case, clearly distinguished, there was a report as of an explosion originating in the cloud overhead, closely followed by an apparent echo, but very much larger in volume, from the large cloud over the lake.

It was undoubtedly a case of reflection, made more apparent by the explosive phenomena unusually localized in the cloud overhead. It is difficult to account for the larger volume of the echo, though it may have been due to a focusing effect resulting from the shape of the reflecting cloud.

UNIVERSITY OF MINNESOTA. B. F. GROAT.

The Patent Office Gazette.

To the Editors of Electrical World:

SIRS:—The letter of Mr. H. C. Ford in your issue of Dec. 28, while containing much valuable discussion of the action of the Commissioner of Patents in cutting down the number of claims printed in the official *Gazette* to five, contains also some error.

The *Patent Office Gazette* is not the only official, general publication of the patents issued, nor is it a publication at all, but is really only an index. Only one figure of the drawings is reproduced, and while all the claims have heretofore been published, and only five are hereafter to be published, the claims cannot be understood without the complete specification. Nobody would rely upon the claims standing alone either for validity or scope. The real official publication is the patent itself; 150 copies of the complete specification and drawings are issued gratuitously and distributed to every state capitol and to the clerk's office of every federal district court, and extra copies are printed for sale.

The multitudinous claims often foolishly demanded by applicants, a practice unfavorably commented on by the courts, but for which the Patent Office has its share of responsibility in rejecting functional claims, have made the *Gazette* very bulky and the expense of publication unduly large, $160,000 a year; whereas the change inaugurated by the Commissioner of Patents saves $60,000, reduces the size, and leaves the *Gazette* reasonably reliable, as a mere finger-post and index. Probably the method adopted is better than a mere abridgement or digest, and sufficiently indicates the character of the invention to those interested, who must after all order the full copies of the patents in which they are specially concerned.

However, there are further changes that would be wise and especially beneficial to inventors. The cost of all copies might be reduced to one cent, the present cost for patents when the whole series is ordered. Furthermore, under section 4903, when any claim is rejected, the commissioner is required to notify the applicant, giving him briefly the reasons for such rejection, together with such information and references as may be useful in judging of the propriety of renewing his application or of altering his specification; under this provision there is also ample authority for sending copies of all the references gratuitously to the applicant, enclosed with the official rejection. This would result in an enormous saving of time to applicants, would entail no further clerical work in the Patent Office, and would tend to get the enormous piles of published matter accumulating in the Patent Office out into the world, where it would do the most good. Indeed, inventors and investigators ought in some way to be provided with a complete classified set of all printed patents located in half a dozen of the great cities of the United States, say, Boston, New York, Pittsburg, Chicago, San Francisco, Atlanta and New Orleans, and this might be accomplised by co-operation between the Patent Office and the public libraries in those cities.

NEW YORK, N. Y. JOHN S. SEYMOUR.

To the Editors of Electrical World:

SIRS:—Mr. Ford's letter in your issue of Dec. 28 raises an interesting and important question. I agree with Mr. Ford that the curtailment of the weekly disclosure in the *Patent Office Gazette* as to the subject matter of the weekly issue of patents is ill-advised. Indeed, I think it is a step in the wrong direction.

A patent for invention is a contract between the inventor and the public, whereby in consideration of a full and clear disclosure of the invention the inventor secures a monopoly of use for a limited term of years. The advantage to the public lies solely in the disclosure of the invention and the publicity that is given to it. Any step tending to diminish the publicity given to patented inventions is a step in the wrong direction, for it diminishes the consideration passing to the public.

Again, the public is entitled to know not only the ingenious and useful things that it may employ after the patents for them have expired, but also the things that it must not use until the patents for them do expire. The law conclusively presumes that every individual in the country knows what patents issue every Tuesday in Washington, and what those patents are for, and what the claims of those patents are—not merely the first five claims, but the entire 55, if there be so many. The law does not accept ignorance as an excuse for infringement. The burden would, therefore, in all fairness seem to be upon the administrators of the law to give the utmost publicity possible to the patents that are issued and to the claims of those patents, one and all. To publish only a part of those claims, if they happen to exceed five in number, seems to me to be a step in the wrong direction.

The *Official Gazette* of the United States Patent Office has from its commencement, so far as I am at present informed, published each week all of the claims in full of all of the patents of the weekly issue. To discontinue this practice and instead publish an arbitrary limited number only of the claims, selected without reference to their subject matter or importance, but simply by the accident of their numerical arrangement in the patent, seems like a step backward.

The *Official Gazette* formerly published in connection with the claims a brief explanatory abstract of the invention. This was long ago discontinued. To resume it would be a step in the right direction. The *Official Gazette* to-day publishes inadequate drawings of the inventions, too few in number to disclose the invention and too much reduced in size frequently to be legible. The publication of legible drawings would be a step in the right direction.

The immense increase during recent years in the number and complexity of the patents that are issued weekly, as compared with earlier years, does not diminish the advantage of publicity, nor does it diminish the duty of publication, but rather the reverse.

And in this same connection it is proper, perhaps, for me to add that the admirable digests of British patents that are regularly prepared by the officials of the British Patent Office and regularly published by that office are such a permanent aid in the direction of publicity and accessibility that it seems to me the officials of our Patent Office would do better to turn their attention and their efforts in the direction of adding such publications instead of curtailing the meagre publications now made.

And one more suggestion. It is, of course, possible for anyone to get a copy of a patent from the Patent Office who knows that he wants it and will take the trouble to order it and pay the price. But the difficulties and delays of late years, in getting such copies after the order has been given and the price tendered or paid, have been so great as to discourage investigation and defeat the ends of publicity and exhaust the patience of all save those who must and will have the copies. These delays have apparently been caused by the discontinuance of the early and time-honored practice of the Patent Office of immediately reprinting old patents as soon as the supply on hand was exhausted, and by waiting instead until orders were received, and later until in many cases urgent reasons were given for the copies. This amounts to cheating the public out of the disclosures of things ingenious and useful which the public have bought and paid for by the 17-year monopolies granted by the government, and which disclosures should be given by the government the broadest and the widest possible publication. Those who seek copies of patents, the printed copies of which have been exhausted, should be treated not as enemies of the public purse, but as owners coming in to their own. I am glad to say that the present commissioner has taken steps in the right direction in this matter and improvement is already noted and greater and gradual improvement is promised. Surely it should never be the case, as has been my experience within a few months, that a defendant sued for infringement of a patent is unable for upwards of six weeks to obtain a single printed copy of the patent in suit in order to see what the thing is that he is charged with infringing and in order to make his answer to the bill of complaint.

Those charged at Washington with the duty of administering the finances of the Patent Office and making annual report as to same, naturally desire to reduce expenses and to make as good a showing as possible; but ambitious economy may lose sight of the purpose of the whole patent system and the reason for being of the whole department, which is, not that the department shall be a money-maker for the government, nor yet that the department shall be self-supporting, but that inventors shall be encouraged to invent and to disclose their inventions, and that the public shall have the utmost possible benefit of those disclosures; and publicity, periodical and systematic, and complete and cheap, and the utmost accessibility and the promptest availability of the stored treasures and records of the department are the channels and the means of advantage to the public and the only channels and the only means of advantage.

I, therefore, agree with Mr. Ford that no possible motives of economy in regard to the printer's bill requires or justifies the curtailment in the weekly publication of the claims of issued patents, and I would advocate steps in the direction of fuller publicity and greater accessibility of records in the directions pointed out and in other directions.

I take the opportunity afforded to write thus emphatically because I think a sound public opinion should be created on the subject. There should be no curtailment of the printing and publication divisions of the Patent Office, nor in the high standards sought in the technical examining staff of the office.

New York, N. Y. Wm. Houston Kenyon.

To the Editors of Electrical World:

Sirs:—It is morally indefensible to reduce the *Patent Office Gazette* to the mere index referred to by Mr. Ford in his recent letter printed in your columns. Subscribers who have paid in advance for all the claims of all patents should receive them, of course; it smacks of bad faith to cut off part of the consideration without their consent. The fault, however, lies with the Congress, and the commissioner should not be blamed for what he cannot help; it would perhaps be better to suspend the issue until he has sufficient funds to publish correctly, but that he must decide.

No arbitrary number of claims can be useful, any more than any arbitrary number of claims can sufficiently protect an invention. The opportunity to deceive by putting trivial claims first would not be availed of by any good lawyer, and the others do not get cases big enough to make it matter. No sane patent lawyer or expert attaches any importance to the showing in the *Gazette;* for obvious reasons he must see the whole disclosures in the letters patent themselves. What is done, therefore, interests them less than the manufacturer and inventor.

It must not be forgotten that not a dollar of the public funds goes to the support of the Patent Office, which for many years has more than paid its way. Several millions of dollars (about seven, I think) are in the patent fund, and several more would be there if the various departments quartered in the Patent Office (the building was paid for with inventors' fees) paid a fair rent. Morally, if not legally, what the inventors want the *Gazette* to be, it should be, since they, and not the public, pay the bills.

New York, N. Y. T. J. Johnston.

To the Editors of Electrical World:

Sirs:—Regarding the letter of Mr. Ford relating to the *Official Gazette* of the United States Patent Office, this publication has been increasing in bulk with successive years. It was first published in 1872, two volumes per year; in 1883 it had so increased that four volumes per year became necessary; in 1902 four volumes became too bulky to bind properly or handle conveniently and six volumes were found necessary. This latter increase was due to trade-mark registration, a record of which was made part of the *Gazette* about this time.

The issue of Tuesday, Nov. 19, 1907, appeared with the usual reproduction of one figure of an issued patent, and five claims only, not six, as Mr. Ford states. This has resulted in a welcome decrease in bulk and gives a satisfactory amount of information as to the subject matter of the patent. No complete and accurate knowledge of a patent can be had without a complete copy for examination. The expense of maintaining a complete set of bound volumes of the *Gazette* is not a burden; it is $5 per year subscription, and $2 per volume for binding, say $17 per year; but the shelf space required is more burdensome; this is to-day approximately 100 sq. ft. of wall space, and the rental value of office space is a considerable item. It is like the horse or the motor car—the first cost is not prohibitive.

So far as I am concerned I am very well satisfied with the new arrangement.

New York City. W. B. Vansize.

To the Editors of Electrical World:

Sirs:—The criticisms of Mr. Ford, printed in your issue of Dec. 28, in regard to the recent action of the Patent Office in curtailing the number of claims printed in the *Official Gazette,* are not without considerable force. There is no doubt that the *Gazette* will be less useful to subscribers than before. We think, however, that the Patent Office is perhaps warranted in making this change, for the one reason that the *Gazette* has been growing so rapidly in size that the volumes have become unwieldy and occupy too much valuable space in our libraries.

In the issue of the *Official Gazette of* Nov. 19, 1907, attention was called to this change by the following notice:

"Beginning with this date and number of the *Official Gazette,*

all patents having five claims or less are printed in full. Where patents have more than five claims each, only five claims are printed and the number of claims omitted is indicated in each case. This plan will be followed in each succeeding number of the *Gazette*. All the specifications and claims will be printed in the patents and library edition in large type."

At the beginning of the publication of the *Official Gazette*, in 1872, it was customary to print not only the claims and one or more figures of the drawing of each patent, but also a "Brief" of the specification, the object being to give as much information as possible. This practice continued less than 10 years, however, presumably because the number of issued patents had considerably increased and the size of the bound volumes was becoming unduly large. In 1872 the average number of patents issued per week was about 230; in 1906 the average number issued per week was about 800. In 1872 the *Official Gazette* was published yearly in two small volumes; in 1906 it was, and is at the present time, published yearly in six large volumes. It will be seen, therefore, that unless some measure is taken to condense or decrease the matter published in connection with each patent, the number of volumes per year, or their size, will reach impracticable proportions. The *Official Gazette* was never intended to be a complete disclosure of the contents of the patents noted in it, but was designed rather to give a general idea of the subject matter, so that any one might, from the data given, order from the Patent Office a complete copy or copies of such patents as he was particularly interested in. The recent change is within the discretion of the Commissioner of Patents.

NEW YORK. ROSENBAUM & STOCKBRIDGE.

To the Editors of Electrical World:

SIRS:—In reference to the practice recently adopted by the Patent Office of printing in the *Gazette* only the first five claims of current patents instead of all the claims, as heretofore, I consider the change most unfortunate. The only possible justification I can conceive for the departure is to economize in the make-up and printing of the *Official Gazette*, but if so, it is most deplorable that the inventors of this country should be subjected to the evil effects which must inevitably result, when it is remembered that the Patent Office is one of the few money-making bureaus of our government. During its existence the Patent Office has turned over to the Treasury a good many millions of dollars in excess of its expenses, and this money has come from the pockets of our inventors. The policy of the government toward inventors should be to encourage them in every possible way by which their interests may be advanced, and not to interpose difficulties and pitfalls in their paths. Of course, inventors and attorneys living in Washington, or those who have access to the bound volumes of complete patents, will not be seriously prejudiced; but most of the inventors and attorneys are not so fortunately situated and must depend to a large extent on the disclosures of inventions found in the *Official Gazette*.

With the complete claims in the *Gazette*, it is possible in most instances to obtain a fairly accurate idea of what a patent may cover, but with only a portion of the claims printed one must necessarily be entirely in the dark. In fact, it would be just as well not to print the claims at all, because to print only the first five claims will give no indication whatever of what the others may be, and undoubtedly the temptation will be very hard to resist in the future to introduce the broad claims after the specific claims of the patent, so as thereby to withhold as much of a disclosure from the public as possible. The change means that in the case of every patent containing more than five claims which an inventor or attorney may have to consider, a complete copy must be ordered from the Patent Office, involving delays of from a few days to two weeks for the transmission of the mails alone. Furthermore, it very frequently happens when orders for copies of patents are given that the entire edition is found to be exhausted and to reproduce the copies means a further delay of three weeks or more. A person interested in concealing from the public the true scope of his patent could by promptly exhausting each edition as printed, and at an expense of only a few dollars, keep from the public practically all knowledge of the scope of the patent. It is not difficult to see that such a state of affairs might result in intolerable annoyance and oppression. Unless, therefore, some very good reason exists why the change should be continued, I think that every effort should be made by inventors of this country to have the old practice restored.

ORANGE, N. J. FRANK L. DYER.

To the Editors of Electrical World:

SIRS:—I have read with interest the letter on this subject in your paper, signed by W. C. Ford. I do not find this name in the last "Roster of Registered Attorneys," therefore, am led to the conclusion that this gentleman is not a patent attorney and therefore not qualified to speak as such.

The fact that all the claims of patents are not now published in the *Official Gazette* is not concealing them from the general public, because printed copies of all patents are obtainable, and these copies are also bound in volumes and some libraries contain these bound volumes complete, the same being accessible to the general public. In what sense Mr. Ford considers the claims of a patent "a part of the Federal Law" I am at a loss to comprehend; their grant or issue is not an act of Congress, or in any respect part of its proceedings, and even while they are a "prima facie" evidence of novelty, they are not a guarantee thereof, for the Patent Office (like everything of human origin) is not infallible.

The *Official Gazette* is printed under the eye of the Patent Office, independent of other government printing, and is paid for by the fees inventors pay into the office with their applications and is no part of the Congressional expenses. The Patent Office officials are alone responsible for printing the *Official Gazette* with only five of the claims of patents published, and the responsibility rests very lightly, for this action is one of the best in the line of progress the office has made; it is no disadvantage and can work no hardship for the following reasons:

1. These first five claims are usually the broadest or most generic of all the claims granted, and disclose the basic structure.

2. The remaining claims—when there are any—are specific and for details or sub-combinations, and are of secondary importance alongside the generic claims.

3. The complete drawings of patents never have been published in the *Official Gazette* or the previous Patent Office reports; consequently a copy of the patent was always needed for a full disclosure of the drawings.

4. Claims cannot well be read without a full disclosure of the drawings.

5. The disclosures by drawings and claims are now on the same level, with the advantage of less weight to handle and less space on the shelves of cases, and reduced cost for publication, thus leaving the Patent Office funds to be spent for more important uses, and as a stroke of business policy increasing the sale of copies of patents and consequent revenue, as well as disseminating an accurate knowledge of the patents granted.

The British Patent Office, like our own, has always printed for sale copies of British patents and these can be found in bound volumes in the Astor Library and possibly other large libraries; but the *Journal* of the British Patent Office only gives a figure of the drawings and a mere digest or summary of the invention, so that this publication is of less value than our *Gazette* with the six claims.

My own experience, extending over a period of more than 30 years, goes to show that any inventor or client who is interested in any particular patent for any reason, is sufficiently interested *to obtain a copy thereof* for a full disclosure and knowledge of the contents, for in no other manner—except through the bound volumes of copies—can a full, accurate knowledge be obtained, and in a matter of importance any knowledge short of a full knowledge is inadequate and misleading. This would

obtain even if the claims of patents were published complete in the *Official Gazette*.

It is the concensus of opinion among all with whom I have talked on this subject, and also of those whose opinions have been quoted in my hearing, that this action of the Patent Office is not "ill advised economy," but advantageous to an extent outweighing any possible disadvantages.

The statement of Mr. Ford in his article that attorneys will no doubt arrange the first five claims of their cases so that when published they will practically disclose nothing of the invention, suggests a departure from the usual practice, which I believe disadvantageous, and further, suggests an excuse for a form of deception. This form of claim would also be impossible of realization because the Patent Office would not pass such claims to issue and a claim not a disclosure of an invention would in a suit for infringement be declared invalid by any competent court.

New York. Harold Serrell.

To the Editors of Electrical World:

Sirs:—In the matter brought up by Mr. Ford, concerning the abridgment of the claims in the *Gazette* to a maximum of six, for each patent, I repeat below the substance of my remarks to another association which called for my views.

The Commissioner of Patents is so accustomed to reading and understanding claims himself, that no doubt he considers they are easily understood by inventors, too. I have found, however, that prominent engineers, professors and manufacturers have not been able even to grasp the meaning of claims which I have prepared for the applications for patents *on their own inventions!* Claims are technical briefs, to be sure, but they are couched in such legal form that only a patent attorney can appreciate their true meaning. For certain reasons, also, from a literary point of view, claims are not intelligible for the purpose of understanding an invention. In order to know what an invention is, we must not only know its constitution, but its operation, advantages and uses. Now, a claim sets forth only the structure, and therefore one cannot understand the nature of the conception underlying the invention until he is versed in the operation, advantages and uses of the invention.

I believe, therefore, that the *Gazette* is at fault in containing any claims at all. Instead thereof, each invention should be set forth by a brief description of the leading ideas, which would take less space in the *Gazette*, and would be useful in letting inventors know the nature of the various inventions.

For five dollars per year (the subscription price), inventors could then have before them, 52 huge pamphlets, forming a valuable library of intelligible matter; whereas now, they have a mass of legal definitions of inventions that are from their very nature, impossible of understanding.

In some other countries, digests instead of claims are inserted in the official organ.

New York. Edward P. Thompson.

DIGEST OF CURRENT ELECTRICAL LITERATURE.

Dynamos, Motors and Transformers.

Constant-Current Machine.—E. Rosenberg.—Fig. 1 shows his constant direct-current machine (See Electrical World, Nov. 10, 1906, page 918). It has two sets of brushes *BB* and *bb*, the latter being short-circuited. The fundamental idea is that "if the resistance of the external circuit is not too large the current

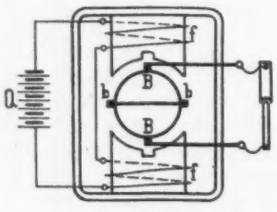


FIG. 1.—DIAGRAM OF MACHINE CIRCUITS.

in it assumes approximately such a value that the armature flux produced by it ('tertiary' flux) becomes opposite and equal to the original flux ('primary' flux). For this reason the current produced by the machine is almost constant and independent of the external resistance and of the speed." It gives constant e. m. f. when the external resistance remains constant. This machine may be changed so as to suit those cases in which part of the external resistance varies while another part

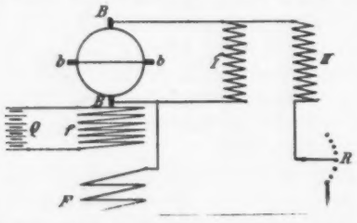


FIG. 2.—DIAGRAM OF EXCITER CONNECTIONS.

remains constant and where constant voltage is desired with variable speed. This is, for instance, the case in connection with the Ilgner (Ward-Leonard) system of electric winding in mines. If in connection with the three-phase motor, flywheel, direct-current generator set, an ordinary direct-current machine coupled with the flywheel would be used for excitation of the direct-current generator and winding motor, the variations in speed would offer distinct disadvantages. The author uses as exciter the machine which is shown in Fig. 2. In this case only the excitation of the winding motor is constant, while the excitation of the direct-current generator varies continually between zero and the maximum value. The machine is provided with a shunt and with a main winding. "The shunt winding *f* is separately excited and is so designed that the armature can give off useful current equal to the constant portion of the load (in the case chosen the excitation of the winding motor). The main winding *F* is in series with the regulating resistance *R* and the excitation *II* of the direct-current generator. Only that portion of the armature current which is variable passes through this circuit, and the winding *F* is so designed that its

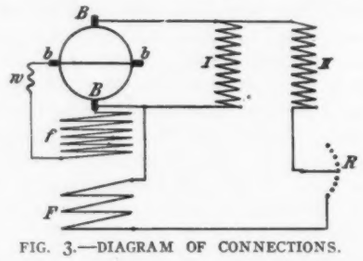


FIG. 3.—DIAGRAM OF CONNECTIONS.

m. m. f. just compensates the tertiary flux produced by this part of the current." Practical experiments have shown that this compensation can be obtained with great exactness. The current in the circuit *II* could be varied between zero and three times the constant current in the circuit *I* without any considerable change of the voltage at the brushes *BB* or of the current in the circuit *I*. It is unnecessary to excite the shunt winding *f* separately since the arrangement of Fig. 3 has given satisfactory results. An iron resistor *w* is inserted to keep the exciting current in the winding *f* constant. Applications of these methods to train lighting are described.—*Elek. Zeit.*, Dec. 19.

Induction Motors.—R. Goldschmidt.—A continuation of his long illustrated and mathematical paper on the leakage of in-

duction motors. The different classes of leakage are dealt with separately. Curves are given for the leakage with different slot dimensions and also tables showing the effect of the coil ends with different classes of windings. The calculation of the leakage factor with polyphase and single-phase motors and the influence on it of different forms of windings is shown, and an example is given showing how to use the curves, formulas and tables.—Lond. *Electrician,* Dec. 20.

Single-Phase Motors.—A long serial describing the action and properties of the different types of single-phase motors which have been proposed or built in the past, with diagrams of the different machines.—*Dingler's Polytech. Jour.,* Oct. 12, 19, 26, Nov. 2, 9, 16, 23, 30, Dec. 7, 14, 21.

Lamps and Lighting.

Metallic-Filament Lamps and Incandescent Gas Lamps.—VOSS AND ZINCK.—Two papers read before the German Society of Gas Engineers. Voss gives a review of the various metallic-filament lamps, describing the osmium, tantalum, zirconium and tungsten lamps. The zirconium lamp is made both for 110 and 220 volts. It consumes from 1 to 1.2 watts per hefner candle and has an average life of 200 hours. The price is 4 marks (about $1.00) for the 110-volt lamp and 6 marks for the 220-volt lamp. The lamp is made for 110 volts with an output of 35, 56 and 80 hefner candles and for 220 volts for 70 hefner candles. The lamp must be used in a vertical position. For the tungsten lamp the specific consumption is given as one watt per hefner candle and the useful life as 1000 hours. While only 110-volt lamps are sold at present, the manufacture of the 220-volt osram lamp is practical. The price of the tungsten lamp is from 3 to 3.50 marks for lamps of from 25 to 50 hefner candles, and 5 marks for lamps of 100 hefner candles. It is expected that the specific consumption may be reduced to one-half watt per hefner candle. Zinck, while agreeing that these lamps represent a great progress, claims that their operation is more expensive than that of gas lamps, namely, from 2½ to 4½ times as much. He thinks that the inverted gas incandescent lamp will be the gas lamp of the near future.—*Jour. f. Gasbel.,* Nov. 9.

Flame Arc Lamps.—A. BLONDEL.—A translation in abstract of his French paper, which has already been noticed in the Digest, on recent progress in flame arc lamps. The difference between the incandescence and luminosity phenomena are pointed out and diagrams are given showing the distribution of illumination from different flame arc lamps without and with globes. The paper concludes with a table giving the comparative costs of various kinds of lighting, for which purpose the price of gas is taken as being four cents per cubic meter (or $1.14 per 1000 cubic feet) and of electricity 14 cents per kw-hour.

	Candle-power		Hourly consumption	Price per hour, cents	Heat expended calories per hour	Cost in cents per 100 mean sph'l c.p. hours
	Horizontal	Mean sph'l				
Incandescent gas.....	575	400	620 litres	2.48	3,200	0.62
Ordinary c.c. arc....	...	1,200	600 kw-hr.	8.40	380	0.70
Ordinary a.c. arc....	...	600	600 kw-hr.	8.40	380	1.4
C.c. flame arc.....	...	1,200	200 kw-hr.	2.80	130	0.234
A.c. flame arc.....	...	1,200	300 kw-hr.	4.20	200	0.35

—Lond. *Electrician,* Dec. 20.

Illuminating Engineer.—L. GASTNER.—A paper read before the (British) Association of Engineers in Charge, on the province of the illuminating engineer. "Until the last few years the question of proper illumination had not received adequate recognition at the hands of either the gas or the electrical engineers. Their business has been to supply energy but not illumination, and the consumer has been left to make the best use he could of the illuminant provided." Some practical illumination questions are discussed; among them the advisability of instruments measuring quickly and directly illumination with an accuracy sufficient for ordinary practice.—Lond. *Electrician,* Dec. 13.—In an editorial on the subject, the belief is expressed that there is no need for a special illuminating engineer and that "existing engineers—the consulting engineer, the station engineer and whoever is concerned with such matters as part of his usual work—should take the trouble to inform themselves on these questions without producing a new class of engineers." Concerning the proposed formation of an illuminating engineering society in England it is thought that matters of illuminating engineering should be taken up rather by existing societies like the Institution of Electrical Engineers, instead of forming a new society. It is also thought to be inadvisable to launch a new publication devoted to illuminating engineering.—Lond. *Electrician,* Dec. 20.

Power.

Energy Transmission in France.—The Prefet de la Seine has appointed a commission to study from a scientific, business and financial standpoint the problem of transmitting electrical energy generated from the falls of the Rhone River to Paris. The commission consists of 13 members, Mr. Maurice Levy being the chairman. M. LeBlanc is also a member of the commission.—*L'Ind. Elec.,* Dec. 10.

Energy Transmission in France.—H. ARMAGNAT.—Continuation of the illustrated description of the net work of electric stations along the coast of the Mediterranean Sea. The methods of maintaining constant voltage by means of Thury or Tyrill regulators and by means of transformers with an adjustable number of secondary turns are described, as is also the equipment of the chief transformer station.—*L'Industrie Elec.,* Dec. 10.

Pulverized Coal.—W. D. ENNIS.—An article in which the author discusses the characteristics and preparation of pulverized coal, illustrating and describing the leading types of grinding and conveying devices applicable to its economic use as a boiler fuel. He also discusses methods of firing and construction of the furnace with details of cost of installation and operation. He thinks that the commercial value of pulverized coal is not limited to its use in the boiler furnace, but that it is destined to have a wide-spread application in metallurgical industries where its cheapness will enable it to replace oil and gas for the firing of certain classes of industrial furnaces with no loss of convenience or rapidity of operation.—*Eng'ing Mag.,* Dec. and Jan.

Electric Energy for Rolling Mills.—An article giving details of the first 12 installations of electric reversing mills in Europe. These installations have been made during the last one and a half years. Of these, seven are already in operation, while the other five are in course of erection.—*Stahl und Eisen,* Dec. 18.

Boiler Regulations.—A new set of boiler regulations has been issued in France by the Minister of Public Works. A review of the new points is given.—*L'Industrie Elec.,* Dec. 10.

Traction.

Fifteen Hundred-Volt Direct-Current Railway.—S. HERZOG.—An illustrated description of the Misoxer Valley Railroad opened in 1907 and running from Bellinzona to Messocco, the total length being about 19 miles. The line has many grades, some being 2.9, 3.5, 4.1, 4.8 per cent, while the maximum grade at one place is 6 per cent. There are many viaducts, bridges and tunnels. The generating station is near Messocco, producing both 1500-volt direct current, which is supplied directly to the trolley wire, and partly 10,000-volt, three-phase currents which are used for energy transmission to a sub-station at the other end of the line for conversion into direct current. Each car is equipped with four 66-hp motors at 750 volts. Two motors are connected in series. The electric control system is the same as on the German road from Cologne to Bonn.—*Elek. u. Masch.,* Dec. 8.

Third Rail.—A. D. WILLIAMS, JR.—An article in which the author discusses the physical difficulties arising in installation and maintenance of the third rail on main line railroads. A table of details of the location of third rail on various roads is given. The author concludes that the third rail, either over or under contact, leaves much to be desired in regard to its assistance in the introduction of electric traction, except on those lines handling special dwarf equipment.—*Eng'ing Mag.,* January.

Railway Signaling.—An illustrated description of the Bouneville system of electric signaling in use on an experi-

mental section of a British railway. The signal equipment consists of three parts, that on the line on the base of each signal, that in the signal box and that on the engine. A battery, one pole of which is earthed, is connected through a two-way switch and a lamp in the signal box to one of two conductors placed between the running rails. Shoes, fitted on the locomotive, make contact with these conductors, and the position of the signal is by these means indicated in the cab. The equipment is described in detail with illustrations.—Lond. *Electrician*, Dec. 20.

Electric Automobiles.—W. A. Th. Mueller.—The first parts of a long review of recent progress in the construction of electric automobiles. The author deals with the arrangement of the motors, the arrangement of the battery and discusses the question whether the front or the back axle should be used as driving axle. He then deals with the single and two-motor systems, connections and regulation, and the general construction of the automobile, and gives some illustrated examples of recent designs.—*Elek. Zeit.*, Dec. 12, 19.

Installations, Systems and Appliances.

Monocyclic System.—F. Niethammer.—The monocyclic system has been used on some stations, but has been abandoned on account of its disadvantages. Various of these monocyclic stations have disconnected the teaser altogether so as to operate their network by single-phase current. As long as the load consists essentially of motors the monocyclic system behaves similarly to the three-phase system. But when the chief phase is strongly loaded with lamps the system becomes unbalanced. Tables are given showing the poor behavior of a three-phase motor on a monocyclic system.—*Elek. und Masch.*, Dec. 8.

Wires, Wiring and Conduits.

Drawing-In Cable.—W. Plesance.—Some practical notes on drawing cables into pipes or ducts. Some think a serving of jute for lead-covered cables is a good protection, but the author thinks it is rather liable to cause damage since the jute has a tendency to make the cable bind. It is advisable to order the cable in lengths so that all lengths of one size and class of cable to be pulled in at one box shall be rolled together on one or more drums, each drum being stenciled with the lengths it contains and the number of the box for which they are intended. As to the question from which end the cable should be drawn in, the author remarks that, other things being equal, it is always better to pull down a slope than in the opposite direction, and in pulling through a length of pipe which has a sharp bend at one end, such as occurs in a deep dip in a crossing or an awkward bend around a box, the pull should be arranged so that the cable does not enter the bend until towards the end of the pulling. The passage of the ropes through the pipes preliminary to the actual pulling will show whether water is present or not. Manila rope has the advantage over steel rope that it often sucks up any small quantity of water standing in any depression within the run and can be much more safely and easily handled than a wire rope. Whenever possible the cables should be pulled through with their ends hermetically sealed with a lead cap, but as this necessitates the cable being gripped by its lead sheath, the method has its drawbacks, since if rope is used this projects and is liable to catch in the pipe, whereas if wire is used there is considerable risk of cutting into the lead and damaging the insulation. This risk also exists with a rope grip, but in a less degree. A patent device, consisting of a wire mesh, the open end of which is slipped over the cable while the other end is provided with an eye to which the rope is attached, has been successful. This device has been especially satisfactory for telephone cables where the lead is not supported by a solid core. Where cables of any size are dealt with it is safer to pull in not by the sheath, but by the core. The strands of the cable are opened and passed through the eye of the swivel attached to the pulling rope, one-half of the strands used being passed through the aperture in one direction and the other half of the strands in the opposite direction; these are bound back upon themselves. To make the eye in the cable and its attached copper strands waterproof, a hot composition of a cheap variety is poured over the whole of the portion of the cable which is being bared, or else the cable is wrapped from the lead up to the swivel with white tape and then covered with a layer of composition. A refinement is to pour composition inside the junction of the cable with the rope before the taping-up is entirely finished. The cable should be pulled off the drum by one man whose duty it is to prevent any slack forming. If the box is large enough a man should be placed in it to grease the cable and see that it enters fairly into the duct without catching on the top of the pipe. With heavy or stiff cables special cable guides are advisable. When light cables or short lengths are being pulled, operation by hand is considerably quicker than the use of a winch. But the winch has the advantage over hard pulling for busy thoroughfares where a long line of men would take up space and hinder the foot-traffic. When the cable is drawn through, the end must be carefully examined to see whether it shows any sign of damage and, further, whether there is any danger of water having penetrated to the insulation. When the cable has been tested and found in good condition, the ends should be sealed and this should be done with as little bend as possible.—Lond. *Electrical Review*, Nov. 29.

Alternating Current Transmission in Cables.—C. V. Drysdale.—The first parts of a long article, fully illustrated by diagrams, in which the author points out the importance of the study of the transmission of alternating currents in cables instead of single impulses. A graphical method of finding the distribution of current and potential difference in a cable is described, with applications to special cases.—Lond. *Electrician*, Dec. 6, 13 and 20.—A communication by A. J. Albridge criticizing the article in the issue of Dec. 6, and a reply by the author in Lond. *Electrician*, Dec. 13.

Electrophysics and Magnetism.

Radioactivity of Lead.—J. C. McLennan.—The conductivity of air enclosed in lead cylinders has been shown to vary widely with the samples of lead selected. The lowest conductivity observed in air enclosed by this metal corresponded to the production in the air of 23 ions per c.c. per second, and the highest to the production of 160 ions per c.c. per second. These wide variations show that the high activity of lead which has been observed generally is due to the presence of active impurities in varying amounts in the lead, and not to a high intrinsic radiation from the metal. Calculations made on the observations show that the differences in the conductivities of air confined in vessels of different metals, including lead, when free from active impurities, arise from and are due to differeneces in the secondary radiations from these metals. Experiments made with the gamma rays from radium showed that, of the ionizations produced by these rays in air enclosed in lead receivers, two-thirds was due to the excited secondary rays and one-third to the gamma radiation itself. With aluminum cylinders, on the other hand, the measurements show that approximately two-thirds of the ionization was due to the gamma rays, and one-third to the secondary rays excited by this radiation in the metal. Calculations based on observations on the conductivity of air confined in different receivers lead to the conclusion that approximately 9 ions per c.c. per second are generated in free air by the penetrating radiation from the earth.—*Phil. Mag.*, Dec.

Measuring Ionization.—S. J. Allen.—A description of a method of measuring ionization, particularly that caused by radioactive substances. In this method the sensitive quadrant electrometer is used as an indicating and not as a measuring instrument. The ionization which it is desired to measure is balanced against that due to a standard, previously accurately calibrated, and the electrometer serves simply as a means of telling when this balance has been obtained.—*Phil. Mag.*, Dec.

Dielectric Losses.—W. Hahnemann and L. Adelmann.—An illustrated translation in abstract of their German paper on dielectric losses in condensers with solid dielectrics and on an experimental method for determining the damping decrement due to these losses in high-frequency circuits.—Lond. *Electrician*, Dec. 13.

Force Oscillations.—A. STEPHESON.—A mathematical note on the stability of the steady state of forced oscillation.—*Phil. Mag.*, December.

Electrochemistry and Batteries.

Resistance Heating.—An illustrated article on the use of kryptol (a powdered mass of a resistance material mixed with silicates, carborundum, etc.) as a resistor in electric furnaces. Various forms of apparatus are described.—*L'Industrie Elec.*, Dec. 10.

Units, Measurements and Instruments.

Measuring Dielectric Strength.—S. M. HILLS AND T. GORMAN.—In order to carry out some tests on insulation for use on armature coils under conditions resembling those of actual practice the authors have devised a new method which they think is preferable to the usual method of testing a dielectric between two parallel plates. In their method a sample of the dielectric is tested in a laminated iron slot, the arrangement of the apparatus being shown in Fig. 4. A slot 8½ ins. long was built up from ordinary soft-iron armature laminations; the dielectric to be tested was wrapped round a brass conductor and placed in the slot. The disruptive stress was applied by connecting one terminal of the source of supply to the brass conductor and the other terminal to the laminated iron walls of the slot. Conductors of various sizes were used in order to test various thicknesses of dielectric, the size of the conductor being larger or smaller than the first conductor used, in direct proportion to the thickness of the dielectric, thus securing the same pressure on the dielectric. Before being tested all the samples were dried at a temperature of 70 deg. C. for a period of four hours, then stored in a box containing calcium chloride, and used as required. The figure of 60 deg. C. for the running temperature of a dynamo was taken, and all samples were tested in an atmosphere maintained at that temperature. In order to overcome the disadvantage of using several conductors of various sizes, the authors employ a conductor as shown at the top of

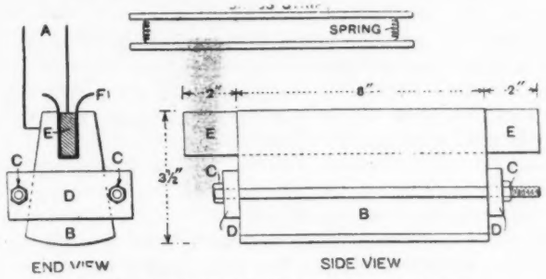


FIG. 4.—MEASURING DIELECTRIC STRENGTHS.

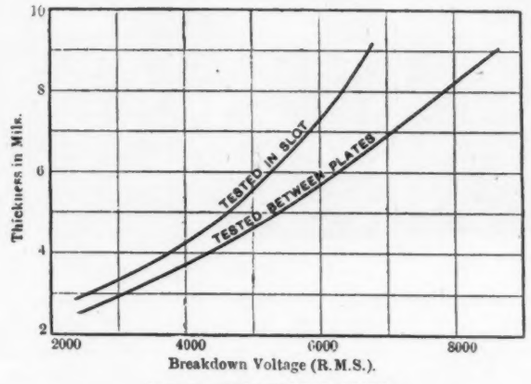


FIG. 5.—BREAKDOWN TESTS.

Fig. 4, which essentially consists of two brass strips kept apart by two cylindrical springs. Since electricity readily discharges from points, and since in the laminated slot there are several points or ridges, it was expected that this method would give a lower break-down voltage than the parallel plate method. This was, indeed, the case, and for Japanese rice paper the breakdown voltage per mill was found to be almost one-third the value obtained by the parallel plate method. The difference is not so great in the tests of parchment paper treated with linseed oil, for which the results are given in Fig. 5. It is important to use a method of gradually raising the voltage without jerks, but fairly rapidly. This is done by the method shown in Fig. 6, a long-range transformer being so placed that the secondary is in the supply circuit and the primary forms a circuit of its own through a rheostat of carbon or water. This provides the regulation, another transformer being employed in the usual manner for increasing the voltage. In this method of regulation the transformer resolves itself into a choking coil, and as the

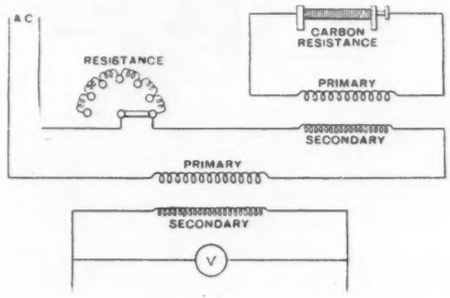


FIG. 6.—DIAGRAM OF METHOD OF VOLTAGE CONTROL.

actual regulation is done in a separate circuit, the increase of voltage must be gradual. The transformer used should be a "leaky" one, and should also be capable of withstanding a short-circuit on the secondary. In order to avoid a rush of current on switching on, a rheostat is introduced into the main circuit. —Lond. *Electrical Eng'ing*, Nov. 28.

Measurement of Iron Losses.—J. SAHULKA.—An illustrated translation in abstract of his German article recently noticed in the Digest on a rapid method of determining the relation connecting the core-loss per cycle with the frequency.—Lond. *Electrician*, Dec. 13.

Telegraphy, Telephony and Signals.

Wireless Telegraphy.—An illustrated description of the wireless telegraph station of the Amalgamated Radio Telegraph Company at Cullercoats, which is the only British station in which the De Forest spark method and the Poulsen arc method are operated side by side. The Poulsen apparatus requires very much less space, which is partly due to the fact that the public supply is by continuous current. The two systems use the same antenna. The transmitting circuit for the arc method is shown in Fig. 7, the oscillating circuit being in shunt with the arc. It comprises an inductance coil of many turns of stout copper and a battery of oil condensers. The spaces between the plates which are sheets of zinc are only about 3 mm. The capacity is arranged in two sections so that though a point of the induction coil is connected to earth the two outers of the public supply remain insulated. A condenser of variable capacity (not shown in the illustration) is kept in parallel with a fixed condenser to enable changes to be made in the emitted wave length, which is usually between 1200 and 1500 meters.

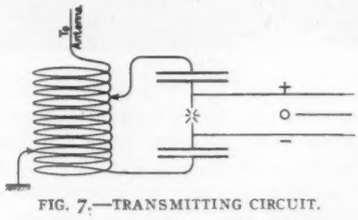


FIG. 7.—TRANSMITTING CIRCUIT.

The coupling of the antenna is "direct and loose." The hot-wire ammeter inserted permanently in the leads to the antenna gives a visible record of the oscillatory current delivered to the antenna. The receiving apparatus is connected to the antenna in place of the sending apparatus by simply turning over a switch. The receiving circuit is shown in Fig. 8. The coupling to the antenna is "electromagnetic and very loose."

This looseness of coupling is possible because with long trains of waves the effects of resonance can be made very marked, and is moreover very advantageous because the resonance curve of a circuit is the sharper and purer the slighter its ties to other circuits. Tuning is effected by the use of a condenser of variable capacity in the resonance circuit. For perceiving the oscillations use is made of the "ticker," which is an electromagnetic trembler in which a very light rapidly moving hammer closes and opens a branch circuit containing

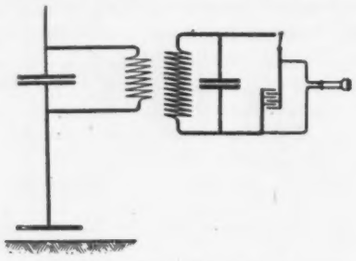


FIG. 8.—RECEIVING CIRCUIT.

a condenser of larger capacity than that in the resonant circuit. The result of the closing of the contact is that a great deal of the energy accumulated in the oscillation circuit passes into the condenser in the branch circuit, and on the opening of the contact the condenser discharges through the telephone. The contact points are made of crossed gold wires. Both the spark and the arc apparatus have approximately the same power, namely, 5 kilowatts. Since there are no insulation difficulties in the arc apparatus it is more compact. The dispatch of a spark message is acclaimed by a string of deafening reports, while the dispatch of an arc message is absolutely silent. As regards the receiving apparatus there are no great visible contrasts between the two methods. The principal feature of the Poulsen apparatus is the sharpness of tuning between the stations and ships of the Scandinavian American Line. Comparative tests of the arc and spark methods have been carried out over ranges of about 900 miles. One of the most interesting points arising out of these tests is the fact that the undamped waves are less obstructed by mountainous country than are the damped waves from a spark transmitter of the same wave-length.—Lond. *Electrician*, Dec. 20.

Wireless Telegraphy.—W. Duddell.—An address comparing the principal differences between the spark method of producing damped oscillations and the arc method of producing continuous oscillations and their applications in radio-telegraphy. The arc method seems eminently suitable for very high speeds of working.—*Science*, Dec. 13.

BOOK REVIEWS.

Die Montage Elektrischer Licht-und Kraftanlagen. By H. Pohl. Hanover: Dr. Max Janecke. 167 pages; 230 illustrations. Price, 2.40 marks.

The subject of the installation of electric light and power plants becomes every day of greater practical importance. The author has sought to give the elements of this subject in this little volume, an exposition adapted to the needs of constructing engineers. The book is well and copiously illustrated. It contains brief directions for the setting up of dynamos, storage batteries, switchboards, mains, cables, lamps, motors and other apparatus. The book will be useful to students of electric installations as indicative of recent German practice.

Correction: In the caption of a review in our issue for Jan. 4, which read as follows:

The Standard Handbook for Electrical Engineers. New York: McGraw Publishing Company. 1300 pages; 1300 Company. 300 pages. Price, $2.50.

the last line was evidently incorrect. This line should have read,

illustrations. Price, $4.00 net.

As will be noted from our issue just referred to the incorrect line is a duplicate of the last line of a caption for the review of another book on the same page, the line of type having become misplaced in arranging the forms for the press.

Single-Phase Motors in Textile Industry.

The polyphase induction motor has long held an enviable position in the operation of all classes of machinery on account of its excellent starting characteristics and its ability to give constant and reliable service with a minimum of attention and repairs. The single-phase motor, on the other hand, has not been so fortunate in gaining the attention of either the manufacturers or the central station men on account of its poor starting characteristics, and for years the manufacturers of single-phase motors have centered their efforts on the production of a motor having all the desirable features of the polyphase machine.

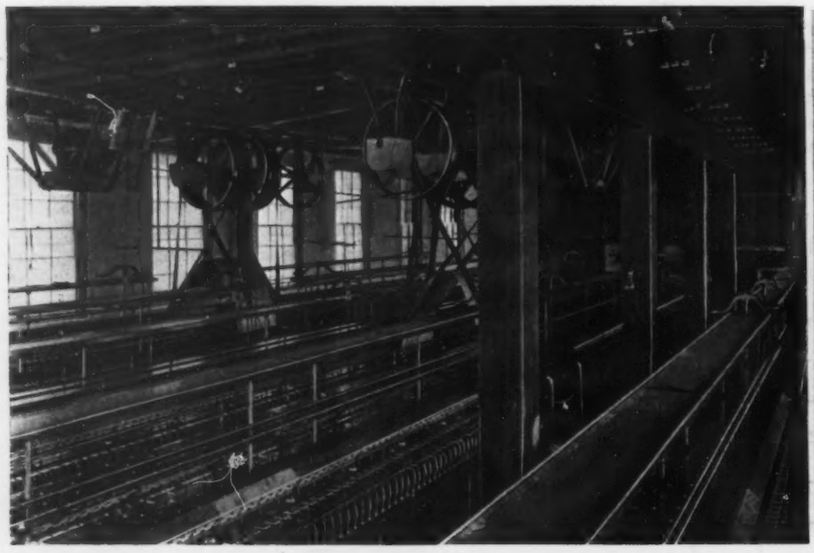


FIG. 1.—SPINNING FRAMES DRIVEN BY SINGLE-PHASE MOTORS.

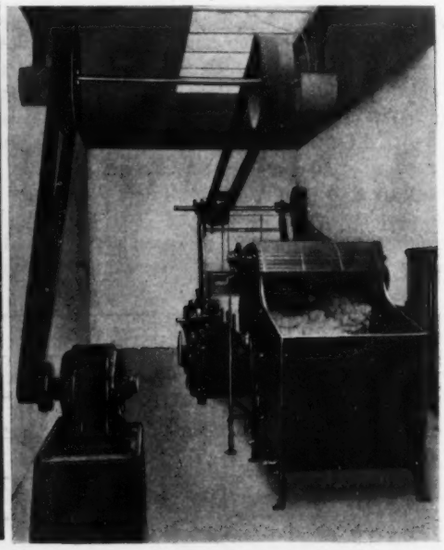


FIG. 2.—MOTOR-DRIVEN PICKER.

An interesting example of the application of the single-phase motor to the operation of textile machinery, and one that is worthy of notice, is found in the factory of the Ayvad Manufacturing Company, of Hoboken, N. J. The product of this company is the "water-wings," a device used by bathers and beginners in swimming to assist in floating the body. The style of drive used throughout is what is commonly known as the "group," in which a number of machines are driven by a motor

from countershafts. The electrical installation consists of nine single-phase induction motors, of a total rating of 75½ horse-power. The type of motor used is the three-phase induction machine developed by the General Electric Company for operation on single-phase circuits.

The conditions influencing the final decision in favor of the single-phase motors were that the factory was located in a part of the city supplied with single-phase energy for lighting and that the motors used must operate without affecting the lamps on the same circuit; also that all sparking of motors must be entirely eliminated. This last condition is one peculiar to textile mills, for in the early stages of cloth manufacture the cotton is in a highly inflammable condition and the least spark might start a disastrous fire. A thorough investigation of the single-phase motor finally selected satisfied the manufacturers that all conditions were met in the design of the motor, all commutators and brushes being eliminated.

Until this year, the practice of the Ayvad Manufacturing Company was to buy the cloth used in the manufacture of its produce from textile mills, its factory converting the fabric into the finished product. Since it was impossible to inspect properly every yard of the cloth for flaws, there often resulted a product of inferior quality. Delays in shipment and in transportation further added to the difficulties of manufacture.

To avoid all delays and to insure a good, uniform quality of cloth a complete textile equipment, from picker to loom, was installed. The textile equipment now enables the company to operate the factory during the entire year, where heretofore only six months' operation was sufficient to supply the demand. Any excess of cloth produced forms a profitable side line. The factory will furnish employment for about 60 persons.

The entire plant is well equipped, roomy, and modern in every respect. It affords an excellent example of the methods by which single-phase motors may be advantageously applied to the operation of textile mills, and it also brings forward to central-station managers the possibilities existing in territories reached by single-phase distribution lines.

Storage Battery Auto-Truck for Industrial Railways.

The Westinghouse Machine Company is putting on the market storage-battery auto-trucks with a carrying capacity of 10 to 40 tons, after having practically tested this type of truck in its own shops for several years. A 40-ton truck complete is illustrated in Fig. 1, and a 10-ton truck, with the deck removed, is shown in Fig. 2.

The steel frame of these trucks is substantially braced, and the journals run in roller bearings. As in street railway practice, the driving axles carry the motors, which are spring-suspended from the frame at one end, and connected to the driving axle by suitable reduction gearing. A spring-suspended cradle of angle iron carries the battery trays. At the operating end of the truck are mounted the controller, brake, charging receptacle, cut-out switch and volt-ammeter. A convenient step and draw-bar head are provided at each end.

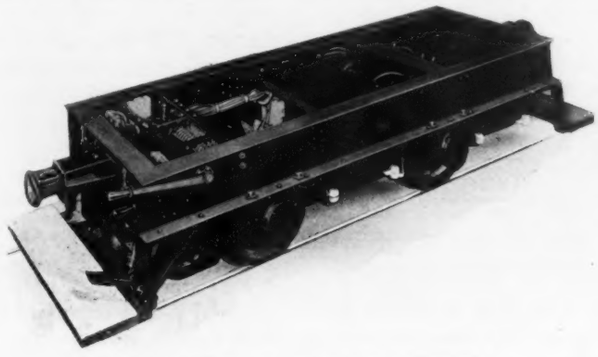


FIG. 1.—TEN-TON TRUCK, DECK REMOVED.

All the machinery is below the top of the frame and is covered by a heavy wooden deck, on which the load is carried. This deck is made in sections, so that any part of the mechanism is readily accessible. The motors are of the Westinghouse vehicle type, capable of withstanding heavy overloads. The controller is also of the Westinghouse vehicle type, giving four speeds in either direction. It is provided with operating and reverse levers, which are interlocking to prevent premature reversal, thus protecting the motors and the batteries.

The battery is contained in two or more trays of cells, and is especially designed to operate at high rates of charge and discharge. The batteries can easily be charged during periods when the truck is not in use.

FIG. 2.—40-TON TRUCK.

During a six months' test of the standard 10-ton truck, the energy required to charge the battery in regular and heavy shop service was accurately metered, and averaged 63 kw-hours per month. At 5 cents per kw-hour, the cost of energy would thus be only $3.15. The work done was recorded and averaged practically 700 ton-miles per month, the loads running from a few hundred pounds to 15 tons.

It is stated that these trucks used as locomotives on a level track and without any weight to secure adhesion can haul, on suitable cars, from one-half to their full rated carrying capacity as a truck, depending upon the condition of the track and kind of bearings on the cars hauled. By placing sufficient weight over the drivers to secure adhesion, they are capable of handling from one to two times their own capacity as a truck for a continuous period of not more than five minutes.

On account of the facility with which these trucks can be handled, delays in the transit of material are avoided, and since the trucks furnish their own energy, the number of laborers required for the moving of material is greatly reduced.

The Brush Lighting System of Galveston, Tex.

The Brush Electric Light & Power Company, of Galveston, Tex., which has been completely remodeling its plant and practically doubling the output, in response to urgent demands from customers for increased service, has recently installed two Allis-Chalmers steam turbines and generators of 1500-kw normal rating, with liberal overload capacity, and converted four of the smaller existing dynamos into motor-generator sets of 400-kw output, mounting them two by two on common bedplates with Allis-Chalmers induction motors of 300 horse-power each. To the steam producing plant, consisting of 1200 horse-power in Heine boilers, has been added sufficient capacity in Erie and Stirling water-tube boilers, operating under a pressure of 150 lbs., to provide for the increase in the electric generating system.

The first of the new units to be installed was a 500-kw machine to deliver two-phase, 60-cycle current with a pressure of 2300 volts, running at 3600 r. p. m., and, soon after this had been placed in operation, it was followed by a unit of 1000-kw rating, at 1800 r. p. m., with the same service characteristics.

Both turbines operate condensing, water for this purpose

being taken from Galveston Bay and lifted by an induction-motor-driven centrifugal pump to two Tomlinson condensers, with discharge directly to the city sewer system—the condensed steam, which is entirely free from oil or other impurities, going, of course, directly to the feed-water heaters. All of this auxiliary apparatus, as well as exciters, switchboards, etc., was also supplied by the builders of the new turbo-generator units.

The ordering of the turbines was hastened by an accident to the power house which occurred during a heavy electrical storm some months ago, at which time lightning entered the station, despite the usual protective apparatus, and resulted in the breaking of a large driving belt connecting the flywheel of one of the principal engines to its generator. As a consequence, the engine ran away and completely wrecked itself.

Inverted Arc Lamps for Press Rooms.

In press rooms, especially where presses are employed on color work, it is essential for the proper matching of colors that lamps giving a light enabling the printer to do this with certainty be installed. During the day it is an easy matter to match colors by the light of the sun; but not all presses cease working at sundown, and many run all night. Two colors extensively used which cause the printer most trouble are yellow and blue. Neither of these can be seen by any of the ordinary sources of artificial light, such as the gas lamp with mantle, the incandescent electric lamp, etc., and the usual practice is to match the color in day time and fill the ink fountains with sufficient ink of the desired tint to complete the run. This, however, is very unsatisfactory, since the printer cannot tell whether the rollers are feeding and also cannot look "into the color" printed on the paper in order to determine the proper quantity of ink to use. It is also difficult to retain good printers for night work without proper light, as they claim color work tends to make them blind. For these reasons color work is usually done during the day. In the color printing plant of the Curtis Publishing Company, of Philadelphia, inverted arc lamps with upper reflectors are used; the upper reflector serving to concentrate the light on the printed sheets on the jogger or board. Fig. 1 is a view of the press room, and shows the arrangement of the lamps very well. The lamp serves three very useful purposes. The source of light is entirely screened so that there is no light of high candle-power in the line of vision to distress the eye and make it less sensitive to the light reflected from the objects which it is desired to work on. There is also no shadow caused by the reflected light, and the latter is of such a quality that it lends itself to the accurate matching of colors. The mechanism of the lamp is shown in Fig. 2. The positive carbon is fed from below, while the negative carbon is stationary above it. The central tube carrying the lower or positive carbon is screwed into upper and lower castings, which form the base plates of the upper and the lower end of the lamp. The upper casting also has a bearing carrying a chain wheel, one end of the chain being attached to the positive carbon; the other end being fastened to a counterweight sliding in a tube. The frame also carries the bearings for the rocker, one end of which is attached to the armature and the other end carries the clutch. The latter is made to engage the chain. The series resistor is connected in the usual way. The negative carbon holder is bolted to the top of the upper casting and completes the circuit for the upper carbons. A long upper frame is provided so that the lamp may be hung a proper distance from the ceiling. The binding posts are on the upper end of this long frame, where they are convenient to the outlets from the ceiling. The lamp is designed for 110-volt direct-current circuits and may be operated two in series on 220-volt circuits. A reflector is provided which just covers the inner globe and which throws the light received from the negative carbon to the ceiling or ceiling reflector, it being understood that where the ceiling is unobstructed and otherwise offers a suitable reflecting surface, the lamp may be used without the upper reflector. The lamp, which is made by the C. J. Toerring Company, of Philadelphia, Pa., is particularly adapted for the illumination of drafting rooms, textile mills, press rooms, and all places where the elimination of sharp light contrasts is an important factor or where true color values are to be maintained.

FIG. 1.—COLOR WORK PRESS ROOM OF THE CURTIS PUBLISHING COMPANY.

FIG. 2.—LAMP.

Mammoth Motor-Driven Planer.

The acompanying illustrations show a motor-driven planer recently installed in the plant of the McIntosh-Hemphill Company, Pittsburg, which is probably the largest and heaviest metal-working planer ever built. The total weight of the machine is 845,000 lbs. Four direct-current motors, having a total rating of 207.5 horse-power, are required to operate the tool.

The machine is, in general effect, an extremly large planer, but, in addition to the mechanisms found on a standard machine, there are many new ones. Each head is fitted with a slotter bar independently driven by a rack, giving a cutting speed that is practically constant from one end of the stroke to the other, and providing a quick return stroke. Through motor and change gears, the cutting and return speeds can be altered as desired. Each head is arranged for transverse planing. The

mechanisms for slotting and transverse planing make it necessary to throw out the regular driving mechanism to the table and connect it to a separate feed device, which, in this case, is entirely distinct from the regular feed gears. The throwing out of the driving mechanism, however, means simply that the pneumatic driving clutches are thrown into and left in their idle position. The machine is fitted with its own air compressor and motor, thus making it independent of the air supply pipes in the shop, to which, however, it can be connected if it seems desirable.

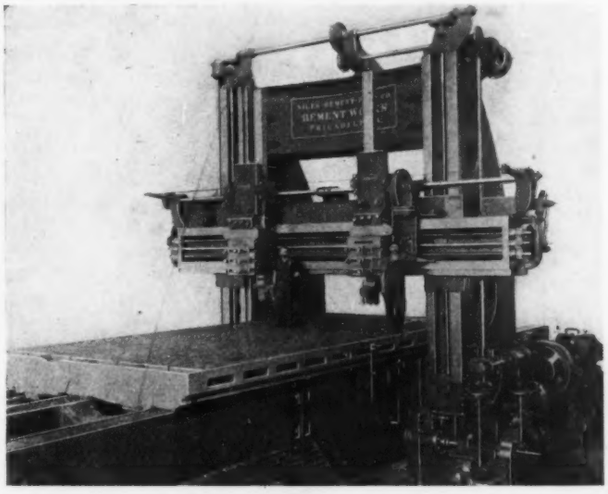


FIG. 1.—GENERAL VIEW OF PLANER.

A complete switchboard is installed for the control of the motors. The main driving motor is rated at 100 horse-power; the motor for lifting the cross-slide is a 20-hp machine; the motor for driving the traversing mechanism on the cross-slide is rated at 7.5 horse-power, while a 30-hp motor drives the air compressor.

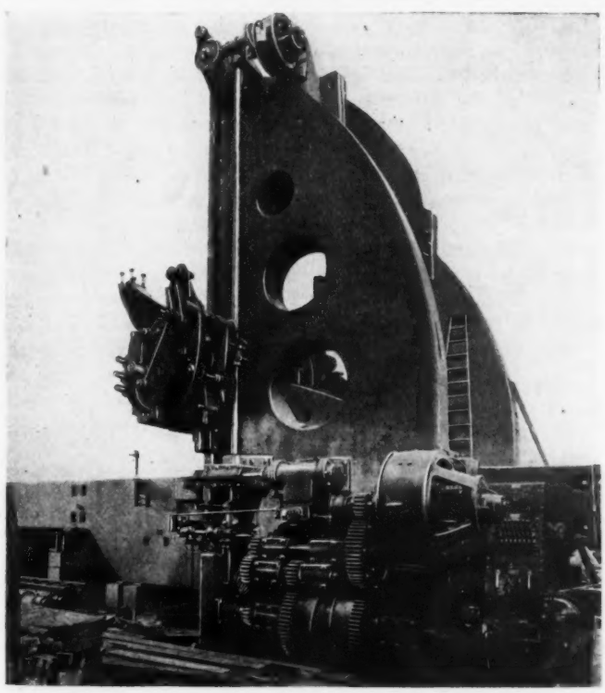


FIG. 2.—DRIVING GEAR OF PLANER.

The main driving mechanism is shown in Figs. 1 and 2, the gearing being connected to the pneumatic reversing clutches at the base of the upright. The speed of the clutches can be varied to some extent by changing the speed of the motor, and a great variation can be obtained by the simple reversal of two change gears. The pneumatic clutches, which are shown thoroughly encased, are provided with a large number of friction discs, whereby great friction area is obtained in a comparatively small compass. These clutches, as their name implies, are operated by compressed air. A small valve, easily moved by hand, controls the stopping, starting and reversal of the table. The handling of this large motor-driven planer, it is almost unnecessary to state, would be quite impracticable if a belt-drive was employed. The remaining devices, in practically every respect, are similar to those found on any planer, except, of course, in this instance they are exceptionally heavy and powerful. It is noteworthy, however, that the feeding devices are operated by compressed air, so that the machinist is not called upon for extra physical exertion.

The above-described planer was built at the Bemont-Niles (Philadelphia) Works of the Niles-Bemont-Pond Company.

Marine Annunciators.

The prime requisite for annunciators in marine service is ability to withstand dampness and moisture. In the annunciator illustrated herewith the coils are treated with a moisture-proof compound and baked so as to prevent any short-circuiting from disintegration of the insulation. Non-corrosive metals are used, so as to prevent all possiblity of rust forming at the pivot points and interfering with the instantaneous operation of the drop. The drop resetting rod passes through a rawhide gasket secured to the inside of the frame. The cover, which is hinged to the backboard, is fitted with a rubber gasket so that when closed the ingress of moisture is prevented. As an additional precaution against dampness, paraffin is run around the edge of the glass where it meets the frame.

MARINE ANNUNCIATOR.

The above equipments are built by the Holtzer-Cabot Electric Company, Brookline, Mass.

A Large Coal Dock with Remote-Controlled Induction Motors.

The Berwind Fuel Company, at Superior, Wis., has a large coal-handling plant for unloading coal from vessels and loading it onto railroad cars or storing it, which is of electrical interest from being entirely equipped with alternating-current motors operated with master controllers and alternating-current contactors. This plant has a movable bridge with three bridge tramways, each equipped with a three-ton clamshell bucket having an extreme horizontal travel along the bridge of 474 ft. These clamshells are used for taking coal out of the vessels and depositing it either on the storage pile on the dock or in car-loading pockets, and for picking up coal off the dock and depositing it in loading pockets. For the hoisting of the clamshell, one 225-hp variable-speed General Electric induction

motor is used. This is supplied with energy from a three-phase, 25-cycle, 440-volt circuit. This motor is of the reversible type, but in ordinary operation it is not reversed, as the weight of the clam is sufficient for lowering. For the horizontal movement of the bucket along the tramway, a 75-hp variable-speed induction motor is used. This is also of the reversible type. The motors are controlled by a master controller on the general plan of the master controller used in electric railway practice. The control circuits, however, are alternating current, and so operate alternating-current contactors. The tramway was designed to make an average of 60 trips per hour, or one trip per minute, thus handling 180 tons of coal. It actually has a record of 100 trips an hour, handling 300 tons of coal. In addition to the bridge tramways, the dock is equipped with two box-car loaders, each having a 75-hp variable-speed reversible induction motor for operating the loader. There are also two locomotive cranes and two movable pockets and screening towers. The entire bridge can be moved along the dock at a speed of 50 ft. per minute by means of 75-hp induction motors on the axles of the track wheels on the front and rear towers. Energy is supplied by the Great Northern Power Company, of Duluth. The sub-station, or transformer house, is located at the dock, which receives three-phase, 25-cycle current at 13,200 volts, and by means of three 500-kw transformers this voltage is reduced to 440 for use by the dock motors.

Commutator Grinder.

Fig. 1 herewith shows a Phillips commutator grinder which has found extensive use abroad and which is now being introduced in this country by Messrs. Figg & Watson, 320 Broadway, New York. The device is intended for truing commutators in position, permitting this operation to be performed without the use of a separate driving apparatus, the grinder being driven from the commutator itself. A clearer understanding of the device and of its operation may be had by reference to Figs. 2 and 3. The supporting frame *A* is clamped around the rocker bearings of the dynamo or motor, or it may be secured to any other fixed part of the machine, provided the part is convenient for the purpose for which the grinder is used. To the main frame is bolted and fixed a standard *B* which carries the slide *C*. The set screw *D* passing through the lug *B* permits of vertical adjustment. The sliding carriage *C* carries

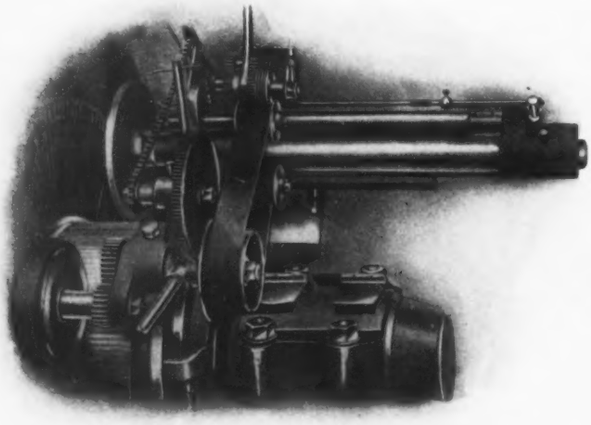


FIG. 1.—COMMUTATOR GRINDER.

the spindle *F*, upon which the grinding wheel is fixed. The grinding wheel is caused to rotate rapidly and at the same time to traverse the surface of the commutator. This transverse movement is brought about by means of the rack *G*, which has a portion of its screw thread cut away so as to form a smooth channel. The rack is carried in bearings at each end of the carriage. The rack can be turned through an angle of 90 deg. so as to bring either the threaded portion or the smooth channel into the top position for the purpose of throwing the automatic gear in or out of action by means of the handle *H*. The slide *C* carries in bearings at its upper side the worm wheel *I*, driven by gearing from a cog wheel itself driven by the chain leading from the friction wheel gearing. When the rack is turned into the engaging position, that is, when the screw portion is uppermost, the worm wheel engages with it and when the apparatus is in action the rack is revolved and the carriage is

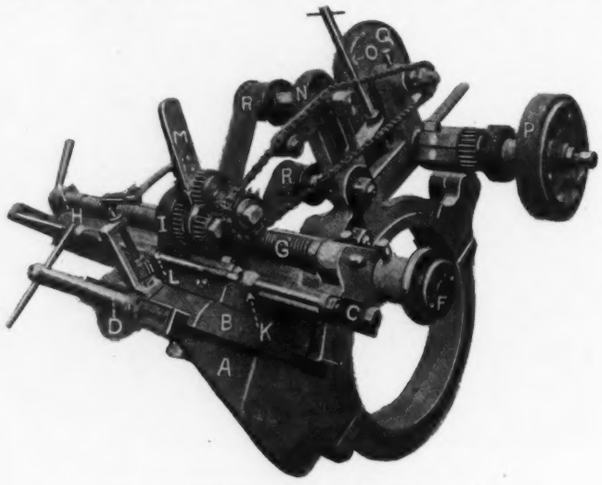


FIG. 2.—DETAILS OF COMMUTATOR GRINDER.

slowly driven forward thereby moving the grinding wheel across the surface of the commutator. The reversing action is governed by the stops *K*, which are adjusted to the width of the commutator. When the stops come into contact with the thread *L*, the action *M* is thrown over, thereby reversing the transverse movement; the grinding wheel, however, revolves in the same direction as before. The driving apparatus is also carried by the main frame, which is pivoted to the center column, marked *O*. This is screwed down until the friction wheel *P* touches the commutator, which causes it to revolve in a direction opposite to that of the commutator. At the end of the bearing is a pulley wheel *Q*, not shown in Fig. 2, but readily seen in Fig. 1, over which a leather belt passes. The belt is continued over two jockey pulleys *R* to a long cylindrical drum to which the grinding wheel is attached. The grinding wheel may be adjusted by means of the set screw *D* to grind only very lightly or may be caused to grind deep. The friction wheel pressure may be adjusted by means of the set screw *O*. The device once set will continue to grind without attention until a further setting is made; the grinding action being automatic. The de-

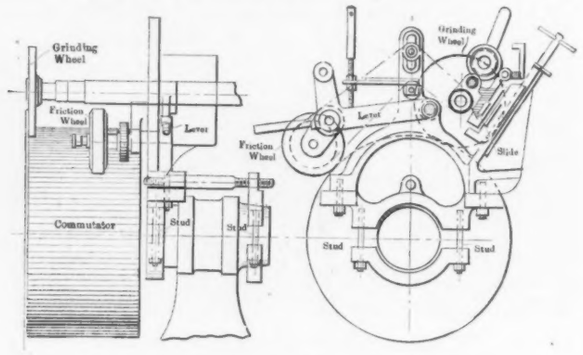


FIG. 3.—GRINDER ATTACHED TO BEARINGS.

vice can also be adapted to any dynamo or motor up to 10 ft. in diameter. The grinding wheel is of carborundum and revolves at very high speed and the finished surface is said to be polished without breaking the mica or dragging the copper. Where no rockers are used, the machine is fixed around the nose of the outer bearing. Distance rings of different sizes are obtainable to fit various sizes of rockers.

Industrial and Commercial News

Commercial Intelligence.

THE WEEK IN TRADE.—Quiet was general in trade and industry, but the financial situation was somewhat improved. Retail trade was slightly stimulated at some cities, but the mild weather limited seasonable distribution at the Northwest, while the holding of cotton affected retail trade and collections in the South. Stock-taking absorbed interest in the wholesale lines and preparations for spring trade are under way. The prohibition laws which went into effect in wide areas in the South has had an important immediate effect on retail trade in that section In the cotton goods trade 1907 closed less auspiciously than it opened, and prices of Dec. 31, were practically the same as those prevailing in January, 1907. The curtailment movement has made great headway in the North, and even in the South it is gaining popularity. The dry goods business was generally quiet at the end of the year, with practically nothing in sight for export. The wool trade opened the year 1908 with only moderate stocks on hand, and prices are somewhat lower than a year ago. In the shoe and leather trade there has been a renewal of confidence with the new year. Lumber, during the week, was generally quiet and traffic on leading railroads is still shrinking. Restriction of output is still noted in iron and steel, though some mills have resumed after the holiday shut-downs. While inquiries for pig iron were more numerous, the actual volume of business was very light. Furnaces are still being blown out of blast, and others are expected to do likewise. The demand for structural material was fair, and new business in plates was quite good. Copper was firmer and steadily held, and the gradual gain in price of the last two weeks was maintained. Sales were not made in great quantity, but inquiry was good. Sales for export were somewhat larger than for domestic consumption. Prices were advanced a little during the week, the closing quotations being 13 7/16c. for Lake, 13 5/16c. for electrolytic, and 13 1/16c. for casting stock. *Bradstreet's* reports 345 business failures in the week ending Jan. 2, against 248 in the week previous, and 185 in the corresponding week of 1907.

THE TUNGSTEN ELECTRIC LAMP COMPANY.—On Oct. 29, 1907, the Tungsten Electric Lamp Company was incorporated under the laws of the state of Ohio, with a capital of $100,000. The incorporators are as follows: Messrs. G. G. Lockwood, A. C. Garrison, H. B. Vanzwoll, A. S. Terry, L. P. Sawyer, H. H. Geary, J. C. Fish, H. C. Rice, E. H. Haughton, E. W. Gillmer, J. B. Estabrook, W. D. Packard, William Coale, E. J. Kulas, J. E. Randall and T. W. Frech, Jr. Mr. T. W. Frech, Jr., was elected president and appointed manager. Mr. J. E. Randall was voted vice-president and made chief engineer. Both of these gentlemen possess experience born of years in the lamp business. A fireproof building, with four stories and basement, having a floor area of 30,000 sq. ft., has been constructed as a factory in Cleveland, Ohio. Its output at the present time is not over 2,000,000 lamps per year. This, however, can easily be increased. The officers of the company have given up all other interests and are devoting their entire time and attention to producing tungsten lamps. The lamp is being put out in 40 and 60-watt sizes for multiple work, and 4, 5.5, 6.6, 7.5-ampere selections with total wattages of 40, 50 and 75 watts for street series service. The specific consumption per mean horizontal candle-power is 1.25 watts.

A CHEERFUL OUTLOOK.—"It is daily becoming more apparent," said President W. H. Whiteside, of Allis-Chalmers Company, in a recent interview, "that the general business of the country has not been so seriously injured by the recent sudden financial depression as the public has been inclined to believe. And I am firmly of the opinion that the thing now most necessary is to loosen the chains of conservatism and give courage an opportunity to assert itself and make advances consistent with the general prosperous conditions and well distributed resources of the country. As the production and use of basic machinery, such as prime movers for the generation of power, is a very potent and a leading factor in our commercial activities, very naturally it is one of the first lines of business to be affected when the pendulum swings from optimism to pessimism, and likewise the first to feel the effect when the change in sentiment again manifests itself. The number and character of inquiries which our offices located in the principal commercial centers of the country have recently been receiving convincingly demonstrate a return of confidence, and bear evidence that not only a diversified, but a large volume of business will be offering ere the middle of the first quarter of 1908 has been passed."

REPAIR ASSOCIATION.—A number of gentlemen, representing electrical repair concerns, met last month in the rooms of the Modern Science Club, 125 South Elliott Place, Brooklyn, N. Y., for the purpose of organizing a trade association, the necessity of which has been felt for a long time. Mr. James F. Hughes, of Chas. A. Borne Company, New York, was elected temporary chairman, while Mr. Leopold F. Luedecke, of the Thompson-Bonney Company, Brooklyn, was elected temporary secretary. Mr. Hughes stated the purpose of the new association, emphasizing the essential reasons why such an association should be called into existence. He touched upon the abuses and impositions the repair man has become more and more exposed to by irresponsible parties, and said that the time is ripe and that they should rise in self-defense. A general debate ensued in which the most salient points of the repair business were discussed. It was decided to name the new organization the Metropolitan Electric Repair Protective Association. The chairman appointed a committee to prepare a constitution and by-laws, consisting of Mr. John P. Bonney as chairman; Mr. Eugene E. Higgins, of the Graham Brothers Company, New York, and Mr. Leopold F. Luedecke. Mr. Hughes then read letters from electrical repair concerns, not represented at the meeting, who promised their hearty co-operation. It was after midnight before the meeting adjourned after every one present had pledged his personal and his firm's support, to meet again Jan. 16, 1908, at the same place, by which time the membership is expected to have doubled.

CUBAN TELEPHONY.—Mr. Howard, the British secretary of embassy, at Washington, has called on Secretary Taft at the War Department in the interest of certain bondholders of the Marianao Telephone Company of Cuba. These bondholders assert that they have been deprived of the right conferred by a Spanish decree to operate telephones in Havana proper. Secretary Taft thought the subject proper for adjudication by the courts, or that at least it should be allowed to remain in status quo until the Cuban Legislature is again convened and ready to deal with the subject.

WHITNEY POWER ENTERPRISE.—Advices from Salisbury, N. C., state that on Jan. 1, the Whitney Power Company on the Yadkin River, at Whitney, N. C., will double its working force and complete the undertaking in time to begin the distribution of electrical energy on July 1. The financial stringency caused some change in the management, but will not interfere with carrying out the original purpose as to completion.

THE COMMERCIAL STREET BOILER WORKS, of Seattle, Wash., are building a new shop for the construction of marine boilers and engines. The shop will be equipped throughout with electric-driven modern machinery, and will have installed two 30-ton Shaw electric cranes, one of which will be operated from the floor. Howatt, MacLean & Company, of Seattle, have charge of the entire electrical installation.

ISTHMIAN CANAL COMMISSION, Washington, D. C., will receive bids until Jan. 20 on various supplies and apparatus, including engine and generator, engine-driven exciter, storage battery, hydrometers, incandescent lamps, and a quantity of mechanical items.

CANADIAN MICA MINES have been shutting down lately and closing out their stocks of mica owing to absence of American demand, and it is stated that the present outlook indicates a scarcity of mica this year in consequence.

LICENSEE SUPPLIES IN CLEVELAND.—The Cleveland Electric Illuminating Company has written a letter to Mayor Tom Johnson, stating that the General Electric Company will be released from its agreement not to sell supplies to a competitor in that city, for the period of one year. The city desired to purchase some of the General Electric products, but found that a licensee contract preventing such purchase existed between the company and the Cleveland Electric Illuminating Company. Thereupon Mayor Johnson wrote the company asking that the agreement be set aside in favor of the city.

THE HOLYOKE MACHINE COMPANY, of Worcester, Mass., has just been awarded a contract by Mr. E. A. Merritt, receiver of the Hannawa Falls Power Company, Potsdam, N. Y., to furnish one of its latest models of type "A" improved governors in connection with the remaining unit of Sampson wheels, which is just being installed in its power plant.

THE PENNSYLVANIA LINES, West of Pittsburg, will install new electric motor and lighting equipment at Mahoningtown, Pa., including three 110-kw Allis-Chalmers 60-cycle, three-phase, 240-volt alternators, and a large number of induction motors ranging from 5 to 15 horse-power.

Financial Intelligence.

THE WEEK IN WALL STREET.—The securities market in the first days of the new year showed a rather cheerful tone with moderate advances, in spite of the Seaboard Railroad system's receivership and other adverse factors. There was a disposition to improve on the lowering of the currency premium and a general feeling, both here and abroad, that normal conditions in the money situation were being steadily restored. The defaults in January interest, such as those on the bonds of the Third Avenue Railroad and the Consolidated Steamship Company had apparently been fully discounted and were not regarded as material reasons for bearishness after the Stock Exchange reopened on Thursday. At the close of the week the market was strong, money was easier, and call and time loans were more freely offered. Interior banks were reported as buying more freely of commercial paper. There was an increased strength and activity in electric and traction shares, and in most cases net advances were recorded, General Electric leading with 3½ points. The curb market during the week rallied sharply, following the lead of the general market. Gains of 25 to 35 points were made in some of the high-priced issues, such as American Tobacco and Standard Oil. There were more inquiries for bonds, including Allis-Chalmers 5s. Following are the closing quotations on Jan. 7:

NEW YORK.

	Dec. 31	Jan. 7		Dec. 31	Jan. 7
Allis-Chalmers Co.....	6	6	General Electric	112	115
Allis-Chalmers Co. pfd.	17	17½	Hudson River Tel.....	—	—
Am. Dist. Tel.....	39*	—	Interborough Met. com.	7⅛	6½
American Locomotive...	34¾	36⅞	Interborough Met. pfd..	18¼	18¼
Amer. Locomotive pfd..	—	86	Mackay Cos.	54	58
American Tel. & Cable..	55	—	Mackay Cos. pfd.....	60¾	61
American Tel. & Tel...	100	101¼	Marconi Tel.	—	—
Brooklyn Rapid Transit.	39	40	Metropolitan St. Ry....	22	—
Electric Boat	—	—	N. Y. & N. J. Tel.....	92	—
Electric Boat pfd.....	—	—	Western Union Tel....	57	57
Electric Vehicle	—	—	Westinghouse com.....	43	41½
Electric Vehicle pfd...	—	—	Westinghouse pfd.....	—	—

BOSTON.

	Dec. 31	Jan. 7		Dec. 31	Jan. 7
American Tel. & Tel...	100	102	Mass. Elec. Ry pfd.....	38½	49
Cumberland Telephone..	—	—	Mexican Telephone.....	—	1¼
Edison Elec. Illum....	208	208	New England Telep....	—	106
General Electric	112	—	Western Tel. & Tel....	—	4
Mass. Elec. Ry.....	8½	10½	West. Tel. & Tel. pfd..	—	50

PHILADELPHIA.

	Dec. 31	Jan. 7		Dec. 31	Jan. 7
American Railways.....	43	43	Phila. Electric	6⅜	5¾
Elec. Co. of America...	9½	9½	Phila. Rapid Transit....	17¼	17⅞
Elec. Storage Battery...	30	31½	Phila. Traction	—	84
Elec. Stor. Battery pfd.	—	—			

CHICAGO.

	Dec. 31	Jan. 7		Dec. 31	Jan. 7
Chicago City Ry.....150*		150	National Carbon	—	53
Commonwealth-Edison ..	78½	78	National Carbon pfd...	—	102
Chicago Subway	16½	—	Union Traction	—	—
Chicago Tel. Co.....	105½	108	Union Traction pfd....	—	—
Metropolitan Elec. com.	15*	15			

*Asked.

PENNSYLVANIA BELL TELEPHONE.—The Bell Telephone Company, of Philadelphia, has notified the Philadelphia Stock Exchange that under resolutions adopted at special meeting of the stockholders of the company, held Dec. 3, 1907, the name of the company was changed from "The Bell Telephone Company, of Philadelphia" to "The Bell Telephone Company, of Pennsylvania," and the par value of its shares of stock changed from $50 to $100 each to take effect Jan. 16, and that upon the opening of its transfer books on that date only the shares of the company of the par value of $100 will be transferred, being the shares of the Bell Telephone Company of Pennsylvania, one share of which will be issued in exchange for every two shares of stock of the Bell Telephone Company of Philadelphia of the par value of $50 outstanding. The company has arranged with H. R. Roney, Seventeenth and Filbert Streets, to purchase or sell such shares of stock of the Bell Telephone Company, of Philadelphia, at $50 per share as will enable stockholders to make the necessary exchange.

WESTINGHOUSE PLANS.—Advices from Pittsburg state that a plan has been made public whereby the receivership for the Westinghouse Machine Company may be dissolved and the business of the company restored to the stockholders. There seems no doubt that the plan will be successful. The arrangement contemplates, in brief, that the company shall issue three-year 6 per cent notes for its existing indebtedness. These notes are to be secured by the company's bonds at 85 per cent of their face value, as collateral, and are to be in denominations of $500 or multiples thereof. Claims of less than $1,000 are to be paid in cash. On claims exceeding $1,000 the creditor will receive three-year 6 per cent notes to the amount of the nearest multiple of $500 that is not in excess of the claim, the balance being paid in cash. It is further agreed that the company will not pay any dividends to its stockholders until provision has been made for the payment of all the notes outstanding. There are about 500 creditors with claims less than $1,000, and 75 creditors with claims exceeding $1,000.

DIVIDENDS.—Jacksonville Electric Company dividends have been declared semi-annual of $3 per share on preferred and $3 per share on common, payable Feb. 1, 1908. The Electric Company of America has declared the regular semi-annual dividend of 3½ per cent, payable Feb. 3. Directors of the Standard Underground Cable Company have declared the regular quarterly dividend of 3 per cent and an extra dividend of 3 per cent, payable Jan. 10. Directors of the National Light, Heat & Power Company have declared the regular quarterly dividend of 1¼ per cent. Directors of the Union Traction Company, of Indianapolis, have declared a semi-annual dividend of ⅔ per cent on the common stock payable Jan. 10. The Fall River Electric Light Company has declared a quarterly dividend of 2 per cent. Directors of the Harbison-Walker Refractories Company have declared the regular quarterly dividend of 1½ per cent on the preferred stock, payable Jan. 20. Directors of the Boston Edison Company have declared a regular quarterly dividend of 2½ per cent, payable Feb. 1. The regular semi-annual 3 per cent dividend for the last half of the year 1907 on the preferred stock of the Guanajuato Development Company, has been paid to stockholders of record Dec. 31. Directors of the Multiphone Operating Company have declared the sixteenth monthly dividend of 1 per cent, payable Jan. 2. Directors of the Western Multiphone Company have declared an initial dividend of 1 per cent, payable Jan. 2.

MEXICAN TELEGRAPH.—The Mexican Telegraph Company has issued a statement for the three months ended Dec. 31 (partly estimated), as follows: Gross, $185,000; total net earnings, $176,500; proportion to Mexican Government, $7,500; balance, $169,000; January dividend, $71,752; surplus, $97,248; previous surplus, $2,059,092; total surplus, $2,156,340. The Central & South America Telegraph Company reports the following statement for the three months ended Dec. 31 (partly estimated): Gross, $425,000; total income, $285,000; January dividend, $145,052; surplus, $139,948; previous surplus, $1,006,499; total surplus, $1,146,447.

THE SOUTH BEND-RAYMOND ELECTRIC COMPANY, of Raymond, Wash., is about to place on the market its first bond issue of $40,000. The income of the system is rapidly increasing, and is now approximately $16,000 per annum. The bonds will run 20 years, and bear 7 per cent interest. Mr. J. H. Marshall, who is vice-president of the company, states that $150,000 bonds will soon be placed for the construction of a trolley line from Raymond to South Bend.

SALT LAKE FRANCHISES.—The Utah Light & Railway Company has accepted the franchise passed by the Council, giving the company a monopoly of the street railways' business in Salt Lake City for the next 90 years. The company is controlled by E. H. Harriman, and has appropriated $5,000,000 for reconstruction and new equipment.

GENERAL NEWS

Construction News.

ELBA, ALA.—The Pea River Water Power Company is said to be considering the development of water power at Elba.

HOT SPRINGS, ARK.—Otis Capelin, city clerk, writes that it is proposed to erect an electric light plant in this city at a cost of about $30,000, bids for which will soon be called. G. M. French is engineer.

LITTLE ROCK, ARK.—The Municipal Electric Company has applied to the City Council for a 50-year franchise. The proposed company is represented by Atwood Benton, of Kansas City, Mo.

PINE BLUFF, ARK.—The Little Rock & Pine Bluff Traction Company, which is now building an interurban railway from Pine Bluff to Little Rock, is contemplating the construction of an electric railway from the Little Rock-Pine Bluff line to Stuttgart. The company has submitted a proposition to the town of Stuttgart, which is now being considered. The company has awarded the contract for electrical supplies to the Westinghouse Electric & Manufacturing Company for $115,000.

CORONA, CAL.—The Corona Gas & Electric Company has entered into a contract with the Pacific Light & Power Company, of Los Angeles, for electricity, and will extend its transmission line to Pedley, a distance of seven miles, to connect with the Pacific Light & Power Company's station at that place. The transmission line will have a potential of 17,000 volts.

EUREKA, CAL.—It is reported that the North Mountain Power Company has secured an option on the property and holdings of the Eureka Lighting Company. C. G. O. Miller is president and manager of the Eureka Lighting Company.

INWOOD, CAL.—We are informed that the Shasta Power Company commenced supplying the Redding Shasta Company with electrical energy Dec. 1, 1907. The power house of the Shasta Power Company is located on Snow Creek, 28 miles from Redding. The length of the water conduit is 35 miles, of which 17½ miles consists of ditching and flume. The present equipment of the plant is rated at 1200 kilowatts. The transmission lines have a potential of 40,000 volts. The officers of the company are H. Shannon, president; A. Rossi, vice-president; G. Scalmanini, secretary, and Fred C. Turnbull, superintendent.

LOS ANGELES, CAL.—Two large engines in the power plant of the Los Angeles Gas & Electric Company were destroyed by an explosion Dec. 27, causing a loss of about $125,000. Arrangements have been made to secure electricity from other companies until the engines can be replaced.

LOS ANGELES, CAL.—Creditors of the Electric Heating & Manufacturing Company, of Dolgeville, have filed a petition of involuntary bankruptcy in the United States district court. It is explained that the action is taken by friendly creditors who desire to forestall radical action. The assets of the company are given as $41,000 and the liabilities as $26,000. W. A. Vetter is president of the concern, which was organized three years ago.

LOS ANGELES, CAL.—The Southwestern Home Telephone Company has recorded in San Bernardino County a trust deed, conveying all of its franchies and personal and real property to the Southern Trust Company, of Los Angeles, for the purpose of securing a bonded indebtedness for the sum of $1,000,000. An examination of the trust deed would indicate that the Southewestern Home Telephone Company plans to make extensive improvements to its system as under the terms of the deed $500,000 of the bonds are to be delivered immediately, the proceeds to be used for that purpose.

MENDOCINO, CAL.—Owing to the high cost of fuel the Mendocino Electric Light & Power Company has extended its transmission lines to connect with the system of the Fort Bragg Electric Light Company, and now takes energy from that company on a percentage basis of gross receipts. The Mendocino company has installed new transformers and is not now operating its plant, the equipment of which is for sale. A. Brown is secretary and manager.

REDWOOD CITY, CAL.—The Board of Supervisors has granted W. J. Martin a franchise for an electric light plant in the First Township.

SANTA BARBARA, CAL.—The Merchants' Mutual Light & Power Company will build a transmission line into the Goleta Valley, a distance of 12 miles, in the spring, to supply electricity for pumping purposes, and also for lamps. It will operate the three-wire system at 11,000 volts, 60 cycles. The company has just completed a transmission line along the ocean front, called the Mesa, a distance of six miles, to furnish electricity for lamps and motors. F. W. Hunter is manager.

CREEDE, COL.—The power plant of the Happy Thought mine was recently destroyed by fire, entailing a loss of $100,000.

DELTA, COL.—The Delta Electric Light Company is planning to install an additional engine and alternating-current generator of from 75 to 100 kw. J. E. Shue is treasurer and manager.

TORRINGTON, CONN.—It is understood that the Connecticut Company, which owns and controls the Torrington & Winchester Street Railway Company, contemplates changing the power house from Burrville to Torrington. It is reported that the new power house will be erected on the site recently purchased by the railway company on North Elm Street.

COEUR D'ALENE, IDAHO.—The Consumers' Company, Ltd., informs us that it is going to install in its plant an electrically driven pump of about 150 or 200 hp. George Harding is manager.

DAVIS, ILL.—The capital stock of the People's Mutual Telephone Company has been increased from $10,000 to $15,000.

EAST MOLINE, ILL.—Harry Schriver, of this city, and J. A. Logsdon, of Moline, have applied to the towns of East Moline and Watertown for a 20-year franchise to construct a gas and electric plant.

JOLIET, ILL.—An injunction suit against the Economy Light & Power Company, of Joliet, to prevent the construction of a dam at Dresden Heights was filed Dec. 30 in the circuit court at Morris by Governor Deneen and Attorney-General Stead. It is contended that the Desplaines River is navigable and that the company's dam will interfere with deep waterway plans.

MANSFIELD, ILL.—William Schuler, of Saybrook, Ill., is reported to have purchased the local electric light plant.

MARSHALL, ILL.—The Blackhawk Light, Heat & Power Company, of Vincennes, Ind., has filed articles of incorporation in Illinois with a capital stock of $25,000. The company will locate in Marshall. The Indiana Company is capitalized at $1,000,000.

MONTICELLO, ILL.—The Monticello Electric Light Company is contemplating the installation of new enclosed arc lamps for street lighting. James P. Lodge is manager.

FARMLAND, IND.—The citizens are considering the question of installing an electric light plant in this place.

GOSHEN, IND.—The directors of the Goshen Home Telephone Company have decided to expend $25,000 in improvement and new equipment for its system.

SARATOGA, IND.—Cyrus Bousman is planning to receive bids for the installation of an electric light plant in connection with his hotel and also proposes to furnish electricity to light the town, including business houses and dwellings. It is proposed to operate the dynamos by a gasoline engine.

SULLIVAN, IND.—The Sullivan Electric Light & Power Company and the Sullivan Heat, Light & Power Company have been consolidated under the name of the Sullivan Lighting Company. The company is capitalized at $50,000 and the directors are A. S. Courtwright and others.

WINCHESTER, IND.—The Winchester Water & Light Company has notified its patrons that after May 1 it will discard its flat rates and all service will be furnished by meter, which will enable the company to furnish a day service.

WINONA LAKE, IND.—The capital stock of the Winona Interurban Railway Company has been increased to $1,200,000.

WORTHINGTON, IND.—At an election held recently the citizens voted to sell the municipal electric light plant at public auction. The plant was established several years ago by the city at a cost of $75,000 and has been operated at a loss.

CARROLL, IA.—The Carroll Light & Power Company has been reorganized and H. G. Long elected president.

ELMA, IA.—The municipal electric light plant was completely destroyed by fire Dec. 29, causing a loss of about $6,000. The plant was insured for $2,000.

RED OAK, IA.—The business men of Red Oak and other prominent citizens of southwestern Iowa are investigating the feasibility of an electric railway from Red Oak via Greenfield to Des Moines. Judge Horace E. Deemer, of the Iowa Supreme Court, is one of the leaders of the movement. A company will be formed in a few weeks to do the preliminary work.

SHEFFIELD, IA.—The Sheffield Brick & Tile Company is contemplating installing an electric light plant for its own use and will furnish electricity for lighting the city.

BELOIT, KAN.—The citizens have voted to issue $15,000 in bonds to purchase the electric light plant.

FORT FAIRFIELD, ME.—The plant of the Fort Fairfield Electric Company, at Stevensville, was destroyed by fire, Dec. 29.

LEWISTON, ME.—The Lewiston & Auburn Electric Light Company has announced that meter rates for electricity for lamps in Lewiston and Auburn will be reduced from nine cents to eight cents per kw-hour. The new rate took effect Jan. 1.

MONSON, ME.—At a town meeting held recently the citizens voted to raise $350 and to appropriate $250 to light the town by electricity.

PORTLAND, ME.—The Portland, Gray & Lewiston Electric Railway Company has completed surveys for its proposed railway from Portland to Lewiston. Work will commence on the construction of the road early in the spring. John A. Jones, of Lewiston, is engineer.

CENTREVILLE, MD.—The Centreville Electric Power Company has completed arrangements for the lighting of Queenstown during January.

EASTON, MD.—The City Council will consider propositions for granting a franchise for a light, heat and power plant, and a contract for lighting the streets of the city. Martin M. Higgins is mayor.

DANVERS, MASS.—The electric plant investigating committee has engaged the services of Harold Davidson, of New York, N. Y., to investigate the municipal electric light plant and report to the committee his opinion of the ways and means to improve the condition of the plant and also make an appraisal of the value of the same.

ESSEX, MASS.—The citizens are considering the question of having the streets of the town lighted by electricity.

HOLYOKE, MASS.—The contract for a 2500-kw turbo-generator for the municipal electric light plant has been awarded to the General Electric Company, of Schenectady, N. Y., for $45,000. The city clerk writes that about $60,000 will be expended for improvements in the electric lighting department. For further information address William H. Snow, manager of lighting department.

LEOMINSTER, MASS.—The Leominster Electric Light & Power Company is contemplating extending its lines to Lunenburg for commercial and private lighting.

SALEM, MASS.—A 60-hp electric motor has been installed in the car shops of the Boston & Maine Railroad Company. Electricity for operating the shops will be furnished by the Salem Electric Lighting Company.

TURNERS FALLS, MASS.—The Connecticut River Power Company is contemplating the construction of a dam on the Connecticut River near Little Rock dam. The company has recently completed its transmission line from Turners Falls to Amherst, Hatfield, Pelham, Sunderland and South Deerfield, a distance of 19 miles.

ALBION, MICH.—The managers of the municipal electric light plant are contemplating changing the 37½-kw dynamo for a 70-kw machine, or changing the entire system to alternating current at 60 cycles. A. E. Ward is manager.

EAST JORDAN, MICH.—The dam of the East Jordan Electric Light & Power Company gave way recently, causing a loss of $75,000. The dam was a concrete structure and held a 25-ft. head of water. The machinery of the plant was not damaged and the village is now lighted by the auxiliary steam plant.

TRENTON, MICH.—The Washtenaw Light & Power Company has purchased the local electric light plant, and has also secured a 30-year franchise from the Morguagon Township Board to erect electric transmission lines into the township over any route desired, which will eventually give the residents of Grosse Isle an electric light service. It is said that the company intends to extend its transmission line from Ypsilanti to Trenton and supply the villages along its line with electricity for lamps and motors.

MINNEAPOLIS, MINN.—The Minneapolis General Electric Company has leased the new dam of the Minneapolis Mill Company and the Pillsbury-Washburn Mill Company for a term of 25 years. This water power will increase the aggregate output of the Minneapolis General Electric Company's system by 25,000 horse-power.

OLIVIA, MINN.—The question of increasing the equipment of the municipal electric plant and installing a storage battery is under consideration. J. F. Morgan is superintendent.

OWATONNA, MINN.—The Rice Lake Rural Telephone Company has been formed to install a telephone line through the eastern part of the county. William Hartle is secretary.

OXFORD, MINN.—The City Council has passed an ordinance authorizing an issue of $15,000 in bonds for an electric light plant.

WALKER, MINN.—The citizens are contemplating duplicating the present equipment of the municipal electric light plant. John E. Gray is chief engineer and electrician.

LEXINGTON, MISS.—The electric light and water works plants were damaged by fire, Dec. 29, and were put out of commission.

MEADVILLE, MISS.—A stock company has been organized recently in Meadville by Lee Rush, of Henderson, Tenn., for the purpose of installing an electric light plant. The equipment of the plant will be shipped from Henderson, where it is at present in operation. The contract for lighting in Henderson expired Jan. 1. It is expected to have the plant in operation in about three months.

RICHTON, MISS.—The electric lighting system recently completed by the Richton Electric Light Company was put into operation Dec. 21. S. E. Shannon, of Hattiesburg, is manager.

KANSAS CITY, MO.—The West Side Council has passed an ordinance requiring the telephone companies to bury their wires in the principal streets in that section of the city.

SEDALIA, MO.—The Sedalia Light & Traction Company on Jan. 2 filed a first mortgage on all of its property, including the Sedalia street railway, power and light plants and realty, to the City Trust Company of Boston, Mass., to secure an issue of $1,500,000 in bonds.

STANBERRY, MO.—The Stanberry Electric Light & Power Company is contemplating increasing the equipment of its plant and will install two boilers, engine and dynamo. J. R. Creighton is manager.

STEVENSVILLE, MONT.—The Missoula & Bitter Root Traction Company has practically completed the surveys for its proposed electric railway. The company is capitalized at $55,000. F. O. Lewis, of Stevensville, is secretary and treasurer of the company.

FREMONT, NEB.—It is said that the City Council has adopted the revised plans of C. A. Chapman, of Chicago, Ill., for the power house for the water and light plant, to cost about $23,045. Frank Hammond is secretary of Board of Public Works.

OMAHA, NEB.—We are informed that the Omaha & Nebraska Central Railway Company expects to award contracts for grading and track material in the spring of 1908, after which active construction work will begin. The proposed railway will extend from Hastings to Omaha, and is to be 159 miles long. The officers of the company are: H. C. Long, of Boston, Mass., president; A. Texter, of David City, vice-president; J. H. Rogers, of Hastings, secretary; E. R. Long, of David City, treasurer, and J. C. Baker, of Hastings, general manager.

SIDNEY, NEB.—The Sidney Electric Service Company is contemplating the installation of another unit of 75 kilowatts, 220 volts, direct connected to a high-speed engine. The company would like to receive prices and information on different types of engines. A day service will be established during the coming summer. W. N. Alexander is superintendent.

LOVELOCK, NEV.—The Lovelock Light & Power Company is constructing a new power plant, the equipment of which will consist of an alternating-current, 2300-volt, 60-cycle, two-phase generator operated by a 200-hp gasoline engine, and by water power, using vertical turbines. No contracts for machinery have yet been closed. W. B. Joslyn is vice-president and general manager.

COLEBROOK, N. H.—The W. E. & W. Drew Electric Light Company is now changing from flat to meter rates. The price for electrical energy will be 12½ cents per kw-hour.

DUBLIN, N. H.—C. F. Appleton, treasurer and manager of the Dublin Electric Company, writes us that the company placed its new plant in operation Dec. 15 and is giving perfect satisfaction. The old plant will be abandoned.

DEAL, N. J.—The New Jersey Consolidated Water & Light Company is planning to install an additional boiler, engine and generator in its plant. F. M. Inman is superintendent.

LAS CRUCES, N. M.—The Las Cruces Electric Light & Ice Company contemplates installing a new unit in its plant in the near future, consisting of a 125-kw, alternating-current generator and a Corliss engine. B. L. Berkey is president and manager.

TUCUMCARI, N. M.—The Tucumcari Telephone Company has increased its capital stock from $5,000 to $25,000.

FORT COVINGTON, N. Y.—The Fort Covington Light, Heat & Power Company writes that it may possibly construct a new dam and establish a day service during the coming summer. W. S. H. Keefe is secretary and manager.

TROY, N. Y.—The Troy Gas Company has nearly completed the work of changing its electric system from 60 to 40 cycles and changing the street lamps from open direct-current series to inclosed alternating-current series. J. F. Cahill is manager of the electrical department.

UTICA, N. Y.—The Utica & Mohawk Valley Railway Company has been granted a franchise to construct a loop over certain streets in the city. The franchise is free for 25 years, with the option of renewal for 25 years upon the payment of $200 for each mile of track.

LONG ISLAND, N. C.—Plans are being considered by the Long Island Cotton Mills for the construction of a hydro-electric plant at Buffalo Shoals, to develop 500 horse-power to operate a proposed cotton mill. The cost of the power plant is estimated at $30,000. Osborne Brown, of Long Island, is president of the company, and George H. Brown, of Statesville, is treasurer.

BELLEFONTAINE, OHIO.—The Ohio Electric Railway Company has commenced excavations at Lewistown Reservoir for its new power house, which will furnish electricity to operate the Lima-Bellefontaine division.

CLEVELAND, OHIO.—The Cleveland Electric Illuminating Company has filed a bill of $54.96 a lamp per year for furnishing energy for street lamps. This is $12.96 less than the figure for the past year and will result in a saving of about $20,000 to the city. In all about 1425 lamps are in use, but an additional number will be put into service the present year.

CINCINNATI, OHIO.—We are informed that arrangements have practically been completed by the Northern Ohio Traction Company for furnishing energy for operating the electric railway between Hamilton and Dayton. The new power station at Lindenwald, near Hamilton, has been equipped with the following machinery: three 1500-kw turbo-generators; one 750-kw turbo-generator; three 300-kw rotary converters, and a battery of eight 400-hp Babcock & Wilcox boilers. The electrical energy generated in this station will be distributed from the sub-station at College Hill, Trenton, Franklin and Dwyer; each sub-station will be equipped with two 300-kw rotary converters complete with six 100-kw, 33,000-volt transformers. The company contemplates placing orders for a number of interurban cars within a few months, to be operated between Cincinnati and Dayton.

HAMILTON, OHIO.—Sealed proposals will be received at the office of the city auditor until Jan. 22, for $20,000 electric light bonds, the proceeds of which will be used for enlarging and improving the municipal electric light plant. T. Straub is city auditor.

MORROW, OHIO.—The People's Electric Company is contemplating installing a producer gas plant. E. G. Wilson is secretary and manager.

SILVERTON, OHIO.—The Village Council has granted a franchise to the Fitzsimmons Telephone Company for a term of 25 years.

BAKER CITY, ORE.—The Eagle River Electric Power Company is contemplating the installation of an 800-kw unit. J. K. Romig is secretary and general manager.

ALLIANCE, PA.—The Town Council has decided against a municipal electric light plant, and has entered into a contract with the Lehigh-Northampton Gas & Electric Company for lighting the town for a term of five years.

BETHEL, PA.—The Blue Mountain Electric Company is planning to install an engine and larger dynamo during this year. H. C. Stambaugh is president and manager.

HARWOOD, PA.—The Harwood Electfic Power Company is contemplating installing two 1500-kw General Electric steam turbines, and raising the line voltage to 11,500 volts, three-phase; also erecting 25 miles of transmission lines. John S. Wise, Jr., is secretary and treasurer.

PITTSBURG, PA.—It is reported that bids will soon be asked for repairs and extensions to the municipal electric light plant of the former city of Allegheny, which will supply electricity for lighting the north side; also to the downtown district of Allegheny.

FAIRMONT, S. C.—The owners of the Tyger Cotton Mills are contemplating the construction of another plant to cost about $300,000. The company has purchased water power property for $10,000, which will be developed to furnish power to operate the proposed mill.

BERESFORD, S. D.—Extensive improvements and additions are being made to the local electric light plant owned by Louis Wagner, including the installation of a 12 x 30 Murray Corliss engine, and another generator, which will be installed some time next summer.

MILLER, S. D.—The Miller Electric Company is contemplating making additions and improvements to its plant, which include the installation of a new engine and dynamos. Ira C. Robinson is manager.

SIOUX FALLS, S. D.—The Sioux Falls Light & Power Company is developing a water power and installing three 500-kw generators, direct connected to water wheels. The work will be completed about Aug. 1. Arthur Huntington is superintendent.

BRISTOL, TENN.—The Bristol Gas & Electric Company will install a large coke manufacturing plant here at a cost of $125,000. The company proposes to utilize the gas produced in the manufacture of coke for fuel for the generation of steam.

KNOXVILLE, TENN.—It is reported that Wilkerson & Boyce, of Asheville, N. C., are making arrangements for the proposed development of water power on the French Broad River and the transmission of electricity to Knoxville. The company plans to construct a 15-ft. dam. About 4500 acres of land have been secured and options have been obtained on other property. Roland A. Thayer, of Lockwood, Greene & Company, of Boston, Mass., is said to be financially interested in the enterprise.

NASHVILLE, TENN.—Arrangements have been made whereby the Nashville Railway & Light Company will furnish electrical energy to operate the cars of the Nashville Interurban Railway Company between Nashville and Frankville. As soon as the Nashville-Franklin division is put into operation, work will begin on the Mt. Pleasant extension.

CROCKETT, TEX.—The Citizens' Light & Ice Company contemplates making extensive changes in its plant and will probably change over to three or five-wire direct-current system. They will use either steam turbines or gas producer plant and will furnish a day service for fans, etc. W. H. Brown is manager.

GORMAN, TEX.—The Gorman Light & Power Company, recently incorporated, is contemplating the erection of a plant, to cost about $15,000. J. R. Barclay has charge of the work.

McCOOK, TEX.—A. R. Scott, manager of the McCook Electric Light Company, writes that the company has recently added to its plant two 35-kw, direct-current generators belted to a 100-hp Weber producer gas engine.

MASON, TEX.—The Mason Ice & Light Company expects to erect new poles and establish a fan service. William Ellebracht is manager.

MINEOLA, TEX.—The Mineola Light & Ice Company will install a 100-hp suction gas producer and engine at once in its plant. The company will use lignite for fuel. J. P. Kittrell is manager.

BLACKSBURG, VA.—D. O. Matthews, superintendent of the electric light plant connected with the Virginia Polytechnic Institute, writes that the trustees are contemplating purchasing a steam turbine and a 240-kw dynamo for the plant.

BRISTOL, VA.—S. M. Vance, superintendent of the Bristol Gas & Electric Company, writes that about $100,000 will be expended for improvements.

DANVILLE, VA.—The City Council has decided to engage an electrical engineer to make investigations with a view of either enlarging the present electric light plant or erecting an entirely new plant.

NORFOLK, VA.—The Seventh Ward Local Board has authorized the lighting committee to make investigations as to the cost of installing and operating a lighting plant.

POMEROY, WASH.—The Tucannon Power Company is installing a steam plant to be used as an auxiliary to its water power plant. W. W. Richards is manager.

PORT TOWNSEND, WASH.—The Citizens' Electric Company will install a 30-kw direct-current dynamo for motor service in the business section of the city. J. M. Kincaid is secretary and manager.

PROSSER, WASH.—The Prosser Falls Land & Power Company is preparing to extend its electric light system across the river to take in the small ranches.

RAYMOND, WASH.—The South Bend-Raymond Electric Company is extending its transmission line to South Bend, a distance of 3 9/10 miles, which it expects to have completed within 60 days, and later will construct an electric railway to connect the two towns, at a cost of $150,000, including equipment. J. H. Marshall is manager.

TERRA ALTA, W. VA.—W. S. Ingram, owner and manager of the Terra Alta electric light plant, writes us that he is installing a new power plant, the equipment of which consists of two 150-hp boilers, two Ball engines and two 150-kw General Electric, three-phase, 2300-volt generators; and is in the market for a switchboard and a closed feed water heater. He also states that he expects to establish a 24-hour service, and will furnish electricity for manufacturing purposes and for pumping the town water supply.

AMHERST, WIS.—B. E. Dwinell & Company, owners of the local electric light plant are contemplating installing a pair of horizontal water wheels to develop 100 horse-power under 10-foot head. B. E. Dwinell is manager.

BARABOO, WIS.—The Baraboo Telephone Company will install 16,000 feet of cable throughout the business section of the city.

DARLINGTON, WIS.—The Darlington Electric Light & Water Power Company is contemplating establishing a power service. C. H. Williams is manager.

LOYAL, WIS.—An election will soon be held to vote on the proposition to issue $17,000 in bonds for an electric light plant and water works system. W. G. Kirchoffer, of Madison, is engineer.

MADISON, WIS.—All bids opened Nov. 22 by the Wisconsin Capitol Commission at Madison, for the equipment for the heating and power plant for the capitol, now under construction at Madison, have been rejected, all being considered too high. The proposed equipment will include boilers, engines, electrical generators and motors, mechanical stokers, pump (feed), pumps (building supply), storage tanks, conveying machinery, hoisting crane and open heaters. The bids ranged from $75,000 to $100,000.

MILWAUKEE, WIS.—The Board of Public Works has sent notices to the various public service corporations requiring them to place their wires in underground conduits to get ready for the elevation of the railroad tracks on the south side.

MILWAUKEE, WIS.—Plans are being prepared for the new power house which will be erected by the Continental Realty Company, near the Commerce Street station of the Milwaukee Electric Railway & Light Company. The cost of the plant is estimated at $50,000. Kirchhoff & Rose are the architects.

MILWAUKEE, WIS.—Bids will be received until Feb. 13 by the Board of Public Works for furnishing and erecting, ready for use in a building and on foundations furnished by the city, all machinery and appurtenances thereto to make a complete gas producer plant at Walker and Davidson Streets. Said gas producer to be a part of the municipal electric light plant. Plans and specifications can be secured on a deposit of $25. Charles J. Poetsch is chairman.

MONTICELLO, WIS.—The question of installing a storage battery in the municipal electric light plant is under consideration. E. L. Babler is superintendent.

PARDEEVILLE, WIS.—The Fox River Milling & Power Company is contemplating the installation of a storage battery in its plant. Myron L. Aldrich is superintendent.

PLATTEVILLE, WIS.—G. H. Kordenat, manager of the Platteville Electric Light & Power Company, writes that the company intends to install an additional engine and alternating-current generator in its plant, and will furnish both alternating-current and direct-current day service.

PRESTON, WIS.—The Preston Farmers' Telephone Company has increased its capital stock from $5,200 to $12,250. H. C. Shephard is president and A. B. Shephard secretary.

CASPER, WYO.—The Casper Electric Light Company contemplates rebuilding its plant entirely and increasing the output. Nathan C. Johnson is treasurer and manager.

CODY, WYO.—The Shoshone Electric Light & Power Company informs us that it expects to install arc lamps for street lighting during the year. George T. Beck is president and manager.

GREEN RIVER, WYO.—The Green River Electric Light & Power Company is contemplating duplicating the present equipment of its plant. George H. Maxam is manager.

CALGARY, ALB.—The City Council has awarded the contract to supply electrical energy for the city to the Calgary Power & Transmission Company for a term of five years. By the terms of the contract the company is to furnish a 24-hour service for $30 per horse-power per year, and to have its plant in operation by March, 1909, and supply 5000 horse-power.

EDMONTON, ALB.—R. R. Kelly, city engineer, writes that the city is about to install a new power station and will require material for six

miles of transmission line at 10,000 volts, three-phase, 60 cycles; also line material including lightning arresters and switchboard at the sub-station; will have eight or nine incandescent circuits, two arc lamp circuits and a motor circuit. He also states that the city is about to install a 200-hp producer gas engine plant and will require new buildings. The building will cost from $8,000 to $10,000 and must be ready for occupancy by May 10. Mr. Kelly will be glad to hear from contractors and makers of reinforced concrete.

AYLMER, CAN.—The Hull Electric Company is contemplating the installation of a 500-kw motor generator in its sub-station. W. R. Baker is vice-president and general manager.

CAMPBELLTON, N. B.—The citizens are contemplating installing a new water tube boiler in the municipal electric light plant and erecting a new chimney. Hiram G. V. Farrer is manager.

TORBROOK, N. S.—The Londonderry Iron Mining Company is contemplating the installation of an electric plant at its mines here.

BRANTFORD, ONT.—The Hamilton Radial Electric Railway Company is seeking permission from Parliament to construct and operate an electric railway from Brantford to a point on the Detroit River at or near Windsor.

BROCKVILLE, ONT.—Extensive improvements and extensions are contemplated for the municipal electric light and power plant, including the installation of a new 250-kw direct-connected unit, the construction of a new chimney, etc. C. W. Wilkinson is manager.

CORNWALL, ONT.—The plant and holdings of the St. Lawrence Power Company have been purchased by a syndicate, of which George C. Foster, of Montreal, Que., is president and managing director. Plans for additions and extensions to this plant, at a cost of more than $3,000,000 have been submitted to the International Waterways Commission.

LINDSAY, ONT.—The capital stock of the Light, Heat & Power Company, of Lindsay has been increased from $125,000 to $300,000.

OTTAWA, ONT.—The contract for supplying lamps and electrical accessories for the Ottawa street lighting system has been awarded to the Canadian General Electric Company, of East Toronto, for $24,672. N. J. Ker is city engineer.

PETROLIA, ONT.—The Petrolia Electric Light, Heat, Power & Gas Company, Ltd., contemplates installing gas engines and gas producers in its plant. W. G. Fraser is manager.

PORT ARTHUR, ONT.—The city will install a 185-kw generator to provide additional energy for the street railway system, at a cost of $8,000. J. McTeigue is city clerk.

PORT HOPE, ONT.—The Port Hope Electric Light & Power Company, Ltd., contemplates installing a 30-in. Samson turbine in its plant. Thomas Tuer is superintendent.

ST. CATHERINES, ONT.—The City Council has granted the Falls Power Company a 25-year franchise in consideration for which the company offers to take over the city lighting contract at the rate of $39.50 per arc lamp per year, and to furnish electricity free of cost for 250 incandescent lamps to be used in public and charitable institutions, maintained by the city. The Hamilton Cataract Power Company is now furnishing energy for the street lamps at the rate of $72.50, but offered to make a contract at the rate of $45 per lamp per year. The new contract is to take effect July 1.

TORONTO, ONT.—The citizens on Jan. 1 voted in favor of issuing bonds to the amount of $2,750, to erect a plant to distribute electricity to be supplied by the Hydro-Electric Power Commission, of Ontario, from Niagara Falls.

WELLAND, ONT.—Frank W. Houston, superintendent of operation of the Falls Power Company, writes that the company will erect a new sub-station in the spring.

WEST LORNE, ONT.—The West Lorne Electric Light Company, Ltd., is contemplating installing a new power plant in the near future. D. F. Webster is secretary.

MONTREAL, QUE.—The Montreal Light, Heat & Power Company has now under construction a 20,000-hp hydro-electric plant at Soulanges, and is erecting a 35-mile, 44,000-volt, three-phase transmission line. The company is also constructing a sub-station at Cote St. Paul, and 10,000-volt tie lines to the city station; and is rebuilding the Chenneville Street sub-station, installing two additional generators in the power house at Lachine Rapids and constructing underground conduits and placing tie lines, etc., underground. R. M. Wilson is superintendent.

THREE RIVERS, QUE.—The North Shore Power Company is contemplating extending its transmission lines to Ste. Anne de la Perade, Batiscan Champlain, Ste. Maurice and St. Malo. Ralph B. McDunnough is manager.

New Industrial Companies.

THE ELECTRIC MEAT CURING COMPANY, of Augusta, Me., has been organized for preparing, preserving, storing and packing meats and fish, etc., by electrical process or otherwise. The company is capitalized at $1,000,000 and the officers are: L. A. Ingals, of Augusta, Me., president, and E. J. Pike, of Augusta, treasurer.

THE PARAGON ELECTRIC COMPANY, of Camden, N. J., has been incorporated with a capital stock of $125,000 by W. E. Groves, H. Warren Caster, and W. B. McDonald. The company proposes to manufacture electrical appliances.

New Incorporations.

SANTA BARBARA, CAL.—The Neilson-Smith Electrical Company, of Santa Barbara, Cal., has been incorporated with a capital stock of $25,000 by F. M. Neilson, B. C. Smith, R. W. Ealand, W. C. and H. T. Neilson.

WILLOWS, CAL.—The Glenn County Telephone Company has been incorporated with a capital stock of $100,000 by J. C. Campbell, A. F. Lindstrom and others.

PUEBLO, COL.—The Pueblo & Arkansas Electric Railroad Company has been incorporated, with a capital stock of $300,000, to build an electric railway from Pueblo to Fowler down the Arkansas Valley. The incorporators are M. J. Verner, Lester Wolf and others.

CHICAGO, ILL.—The Jackson Light, Heat & Power Company has been incorporated with a capital stock of $5,000 by J. E. Baker and others.

INDIANAPOLIS, IND.—The Indianapolis-Cairo Traction Company has been incorporated with a capital stock of $10,000,000 for the purpose of constructing an electric railway from Indianapolis to Cairo, Ill., through the Indiana and Illinois coal fields. The incorporators are A. L. Haas, of York, Pa., president; W. C. Buell, John T. Figg and Charles McDermott, of Indianapolis. The company has taken over the Eel River Railroad Company, which was incorporated two years ago to build a steam road along the same route. The officers of the company state that arrangements are being made with a New York firm to underwrite the company.

MONSON, MASS.—The Monson Light & Power Company has filed articles of incorporation with the Secretary of State with a capital stock of $50,000. The company proposes to generate and distribute electricity for heating, lamps and motors in the towns of Monson, Abbot and Blanchard. The officers of the company are: Harry W. Waite, president, and George F. Barnard, treasurer. The citizens of this place, on Dec. 26, voted to contract with the company to light the streets of the town for a period of not less than five years.

ADRIAN, MICH.—The Sand Creek Telephone Company has been incorporated, with a capital stock of $2,000, by Henry Middleton and others.

PORT HURON, MICH.—The Port Huron Citizens' Telephone Company has filed articles of incorporation with a capital stock of $20,000.

BRECKENRIDGE, MINN.—The Breckenridge Telephone Company has been incorporated, with a capital stock of $50,000, by H. L. Shirley and others.

MEADVILLE, MISS.—The Meadville Light & Power Company has been incorporated with a capital stock of $10,000. The company proposes to erect a plant having an output of 50 kilowatts. The contract for the installation of the machinery has been awarded to the Henderson Improvement Company, of Henderson, Tenn. D. L. Rush, of Henderson, Tenn., is general manager and has charge of the construction of the plant.

BERGER, MO.—Articles of incorporation have been filed for the Berger Commercial Telephone Company. The company is capitalized at $8,000, and the incorporators are E. Blumer, Joseph Rarhgeb, H. Wedephol, H. H. Meyer and others.

DONIPHAN, MO.—The Doniphan Telephone Company has been incorporated with a capital stock of $25,000 by T. L. Wright and others.

SHICKLEY, NEB.—The Shickley Telephone Company has been organized with a capital stock of $2,000. The officers of the company are: M. L. Schelkopf, president; Aruthur Nelson, secretary, and A. V. Vennell, Jr., treasurer.

RENO, NEV.—The Kings Hills Irrigation Power Company has been incorporated with a caplital of $1,000,000 by Charles and Benjamin Hammett, C. B. Hurt, E. L. Rice and O. O. Haga. The company plans to build a large power plant on the Truchee River and also to construct a large irrigation canal, which will irrigate land in Spanish Spring Valley, close to Reno.

PAVILLION, N. Y.—The Pavillion Telephone Company has been organized, with a capital stock of $10,000, by Earl Starr, H. A. Bradley, D. L. Morrow, J. E. Sprague and others.

STEPHENS MILLS, N. Y.—Articles of incorporation have been filed for the Stephen Mills Telephone Company, with a capital stock of $10,000, by E. R. Kilbury and others.

MONTPELIER, N. D.—The Montpelier Telephone Company has been incorporated with a capital stock of $5,000, by Frank S. Eddy and others.

HESLOP, OHIO.—The Heslop Telephone Company has been incorporated with a capital stock of $10,000 by W. L. Hadley and others.

ALDEN, OKLA.—The Alden Telephone Company has been incorporated, with a capital stock of $1,000, by H. S. Sturgis and others.

FLORENCE, OKLA.—The Kent Rural Telephone Company has been incorporated with a capital stock of $840 by J. King, A. V. Ray, of Florence; Ira Wisel, George W. Sneeds and J. Sanfyker, of Byron; J. H. Wilson and J. H. Jessys, of Florence.

BEAVER FALLS, PA.—A charter has been granted to the Beaver Falls & Koppel Street Railway Company with a capital stock of $6,000 to build a street railway in the new town of Koppel, one mile in length; also to the Beaver & Lawrence Electric Railway Company with a capital stock of $6,000 to build a line from the dividing line of Beaver and Lawrence counties to the Hart Farm, a distance of one mile. T. P.

Simpson, of Beaver Falls, is president of both companies, and the directors are: S. L. Tone, C. W. Gibbs, W. J. Horgan, and B. S. Johns, all of Pittsburg.

EAU CLAIRE, PA.—The Butler County Telephone Company has been organized and has applied for a charter under the laws of Pennsylvania.

McDONALD, PA.—The McDonald Electric, Heat & Power Company has been organized with a capital stock of $100,000, by A. W. Valentour, W. H. Young and others.

LANSDOWNE, ONT.—The Lansdowne Rural Telephone Company has been incorporated with a capital stock of $20,000 by W. J. Webster, R. J. Mitchell, O. S. Landon, W. W. Shipman, H. Horton, C. Fredenburg, and G. F. Deane, of Lansdowne.

Legal.

RIGHTS OF TELEPHONE COMPANY IN PUBLIC STREET AS AGAINST ABUTTING OWNER.—That a telephone company, though holding a village franchise, is not authorized to occupy a street, the title to which is held by the abutting owner, against his wishes, without having acquired the right by condemnation proceedings, is a recent holding of the New York Supreme Court. The action was brought by the telephone company and it was alleged that the defendant was the owner of certain real estate in the village of Fishkill Landing; that it had permission from the village to construct, and operate its lines and erect poles on the public streets of the said village; that it did erect such poles, and the defendant cut down two of them and the ropes and wires attached thereto. The question arose whether the defendant was actually the owner to the middle of the street upon which her property abutted. The description of the property in the deed, under which the defendant held title, did not include any portion of the highway but referred to the plot as being bounded by the highway. It was held, nevertheless, that the defendant owned to the middle of the street and that the telephone company could not erect its poles in front of the defendant's property without the defendant's consent except by securing that right by condemnation. Hudson River Telephone Co. vs. Forrestal, 106 N. Y. Supp., 404.

ELECTRICIAN HELD TO BE A FELLOW SERVANT OF MILL OPERATIVE.—The right of a mill operative to recover damages from his employer, in an action recently brought, for injuries received as a result of the lamp circuit in the mill being opened by the electrician of the mill, depended upon whether the electrician and the mill operative were fellow servants within the rule which absolves an employer from liability to a servant who is injured through the negligence of a fellow servant. The plaintiff's work consisted of hauling pulp from the lower section of the mill to a room in the upper part of the mill, called the "Heater" room. The plaintiff was obliged to pull a truck loaded with the pulp over a platform leading from the mill entrance to the platform of an elevator. On a certain occasion the elevator platform was without sufficient light for plaintiff to see to perform his duties. In this condition of the light the plaintiff stepped around the truck to push it from the elevator platform, fell from the platform to the bottom of the elevator shaft, and sustained the injuries complained of. The light was turned off by the electrician in the mill, who had been instructed to use light only when required for the operation of the mill. It was contended that the defendant was liable because the electrician and plaintiff under the circumstances shown were not fellow servants. The argument was that the electrician was employed to perform a separate and distinct part of the work of running the mill, and was given full control thereof by the defendant, and that his duties were so completely separated from those of the plaintiff and the other mill operatives that he could not be said to have been engaged in a common employment with them. It was held that the plaintiff's and the electrician's duties were not so remotely connected as to remove them from a common employment, and a number of instances were cited in support of the holding. Miller vs. Centralia Pulp Co., Supreme Court of Wisconsin, 113 N. W. Rep., 954.

RIGHT OF ELECTRIC COMPANY TO RECOVER AGAINST MUNICIPAL BOARD FOR EQUIPMENT FURNISHED.—In an action against the city of Waseca and the water and light board of that city, by the American Electric Company, to recover for materials which had been furnished by the company for equipping an electric lighting plant, the defenses interposed by the defendant were held to be unavailing and the company was permitted to recover. The plaintiff company had entered into a contract with the board, by the terms of which the plaintiff agreed to furnish and deliver to the board at the city of Waseca equipment, apparatus, and machinery for the extension of the city's light plant, the purchase price of which was $3,700. The plaintiff complied with the contract and shipped the material to the board at Weseca, a portion of which was received and accepted by the board and was never returned. A dynamo, part of the machinery so contracted to be sold, was not shipped at the time of that which was received and accepted, but at a later date. About the time of the shipment of the dynamo a controversy seems to have arisen between the water and light board and the mayor or city council with reference to the propriety of the proceedings by the board, and an injunction suit was brought restraining the further performance of the contract. The dynamo referred to remained at the railroad station during this time, the board being unable to accept it because of the injunction. It was subsequently returned to the plaintiff and sold to other parties with the consent of the board, the company agreeing to furnish a new one when the controversy at Waseca would cease and the board should order it. The plaintiff made due demand for payment for the material furnished and accepted by the board, which the city refused to make, whereupon this action was brought. One of the defenses depended upon by the board was that the action could not be maintained against the board, for the reason that it was a mere agency of the city, incapable of being sued for goods sold to it for the use of the city. It was held that the board was, under the provisions of the charter of the city, clothed with the exclusive superintendence, control and management of the city light plant, and authorized to enter into contracts for and on behalf of the city, within the limitations contained in the charter, and judgment was given in favor of the company. American Electric Co. vs. City of Waseca, et al, Supreme Court of Minnesota, 113 N. W. Rep., 898.

TELEPHONE LINE IN HIGHWAY AS AN ADDITIONAL BURDEN ON THE EASEMENT.—A recent decision of the New York Supreme Court, that of Gannett vs. Independent Telephone Company, of Syracuse, 106 N. Y. Supp. 3, holds that the erection of a telephone line along a city street in front of the premises of an abutting owner is a proper street use and that the abutting owner may not, in such a case, restrain the company from erecting its line nor demand compensation. The decision intimates that where the abutting owner owns to the middle of the street, which as a rule he does, and the street is located in a rural district, or may properly be classed as a country road, the maintenance of a telephone line between the center line and the exterior line of the highway constitutes an additional burden, not contemplated by the original dedication of the highway, and not within the scope of the public use and that as such it may be restrained by the abutting owners, unless the company has received the right by grant or condemnation. But a distinction was made between city streets and rural roads. The action here was by the owner of property at Townsend Street in the city of Syracuse, located within half a mile of the center of the city.

But in a more recent Court of Appeals decision it has been held that the owner of the fee in a city street may restrain a telegraph and telephone company from erecting its poles therein, that a dedication of lands for general street and highway purposes does not include such a use, and that the city has no power to permit it without compensation to the owner. This action was brought to enjoin and restrain the defendant telephone company from entering upon the lands of the plaintiff on Fitch Avenue, in the city of Auburn, N. Y., for the purpose of digging holes and erecting telephone poles for the stringing of wires. With reference to the lower court decisions the court said: "The learned Appellate Division appears to have entertained the view that there was a distinction between rural and urban property. It is undoubtedly true that the use of highways is many times greater in cities than it is in country towns. We had occasion to consider this question to some extent in the case of Palmer vs. Larchmont Electric Company, and in addition to what we then said we only wish to remark that the fee to lands in the city is as sacred to the owner as it is in the country, and that in either place he is protected by the constitutional provision to the effect that property shall not be taken for public purposes without compensation." The court further said: "The primary object of highways is for the public travel by persons and animals and by carriages or vehicles used for the transportation of persons and goods other than by railroads. Sewers drain the surface water from the highways and thus relieve them from impairment and destruction. In this respect sewers are for a street purpose. In addition they may drain also the abutting property and houses, and thus tend to promote the public health. In this respect they are for a municipal purpose. Water supplied by mains through the highways may be used for cleansing and sprinkling the streets. In this respect it is for a street purpose. It may be used by the abutting owners for cleaning and for domestic purposes, and is also used for the extinguishment of fires. In this respect it is for a municipal purpose. Not so with telegraph and telephone wires. They in no way preserve or improve the streets or aid the public in traveling over them. * * * In recent years highways and streets have been appropriated for municipal and individual uses in many instances. This is especially true in the City of New York, where they have been constructing subways or conduits for wires through which there is transmitted electricity not only for lighting, but for teleghaphing, telephoning and power purposes. They have also constructed pipe lines through which steam and other products are conveyed. None of these can be held to be for street purposes, but in that city the municipality owns the fee of the streets, and it may therefore contract, sell or grant the use of the streets for other purposes which are not inconsistent with and do not impair the public easement or use for street purposes. Many of our other cities have followed New York in acquiring the fee of the streets. In such cases the fee having been transferred to the municipality, it can grant rights in the streets other than for street purposes, which do not impair the public easement. We therefore cannot recognize the uses to which highways have been subjected in recent years as changing the law or the property rights of individuals." Eliza W. Osborne, appellant, vs. The Auburn Telephone Company, respondent, *Law Journal*, Nos. 13, 1907, p. 629.

Obituary.

MR. W. B. SENTER, general manager of the Amite Electric Light Company, of Amite City, La., died Dec. 27. Mr. Senter was 39 years of age, and is survived by his wife.

MR. JOHN W. KATES, formerly superintendent of the Western Union Company, of Richmond, Va., and later general superintendent of the Postal Telegraph & Cable Company, with headquarters at Richmond, died Jan. 2 at Manchester, Va. Mr. Kates was in charge of the office at

Manassas, Va., during the battles of Blackburn's Ford and Manassas. He transmitted the famous message from Jefferson Davis to General Joseph E. Johnson at Winchester, ordering that officer to make a junction with General Beauregard at Manassas.

Personal.

MR. F. ALTREDE, of Hungary, royal engineer, has been visiting California to inspect the power plants and long-distance transmission lines.

MR. ALBERT B. HERRICK, having finished a line of experimental work conducted at Ridgewood, N. J., has removed his main office to 120 Liberty Street, New York, where he will continue his practice as consulting electrical engineer and electric railway expert.

MR. F. E. FITZPATRICK has resigned his position as superintendent for the local manager of the California Gas & Electric Corporation in Sacramento, Cal. His time is entirely taken up with his work as general manager of the John Martin traction and lighting properties.

MR. B. S. READ, manager of the Cumberland Telephone & Telegraph Company, at Louisville, Ky., has been transferred to New Orleans, and is succeeded by Mr. J. D. Templeman, manager of the Bell exchange at Nashville. A large reception was given them at Louisville on the occasion of the change.

MR. FRED L. FULLAM, general superintendent of the gas and electric light plants at Leominster, Clinton and Ayer, owned and controlled by the Massachusetts Lighting Company, has resigned his position, the resignation taking effect Jan. 1. Mr. John F. Madden, manager of the Clinton plant also resigned.

MR. VICTOR M. TYLER, of New Haven, Conn., was elected director of the Southern New England Telephone Company at a meeting of the directors held Dec. 30, to fill the vacancy caused by the death of his father, Morris Tyler, who was president of the company. A new president will be elected Jan. 28.

MR. HAROLD ALMERT.—Mr. and Mrs. Jacob Henry Tiedman announce the marriage of their daughter, Anita, to Mr. Harold Almert, Dec. 28, 1907, at Chicago. Mr. Almert is a well-known central-station engineer, formerly manager of the Cicero plant at Oak Park, Ill., and now chief engineer of the Edison Light & Power Company of Wichita, Kan. During 1906 he was president of the Northwestern Electrical Association. Mr. and Mrs. Almert will be at home in Wichita after Feb. 15.

MR. F. H. PLAICE, formerly manager of the New Bremen (Ohio,) Electric Light & Power Company, is now manager of the Thornapple Gas & Electric Company at Hastings, Mich. The New Bremen plant was purchased by the city and taken over Jan. 1, 1908. It will be remembered that Mr. Plaice's paper at the last National Electric Light convention created much comment on account of the thoroughness with which possible sources of revenue had been worked at New Bremen and the large earnings per capita shown by the plant.

MR. W. T. MANNING, Mr. George T. Hanchett and Mr. W. D. Young have become associated as consulting mechanical, civil and electrical engineers, with an office and laboratory in New York, and an office in Baltimore. Mr. Hanchett will have immediate charge of the New York office, and Messrs. Manning and Young will reside in Baltimore. As a contributor to these columns and as the author of several electrical engineering treatises. Mr. Hanchett is well known in electrical circles. Mr. Manning is a member of the American Society of Civil Engineers, and has been prominent in railroad circles for the past thirty years, among other duties having been chief engineer of the Baltimore Belt Railroad and of the Baltimore & Ohio Railroad. Mr. Young began his career with the Thomson-Houston Company, going later with the Edison General Electric Company and the General Electric Company. From 1895 to 1901 he was superintendent of the Baltimore Belt Line electrical equipment and electrical engineer of the B. & O. R. R., and in the latter year visited the Philippine Islands to report on transportation conditions there.

Trade Publications.

DIRECT-CURRENT MOTORS for all industrial plant services are illustrated and described in bulletin No. 50A of the Northern Electrical Manufacturing Company, Madison, Wis.

MINIATURE MOTORS.—Catalogue No. 18, of the Knapp Electric & Novelty Company, 511 West Fifty-first Street, New York, is devoted to a line of well-built miniature electric motors, cars and locomotives.

TRACK DRILLS.—Cook's Standard Tool Company, Kalamazoo, Mich., has issued a well executed booklet of information concerning modern methods of maintenance of railways. Much space is devoted to the Climax track drill and the Standard track tool grinder.

METAL SPOOLS.—The Frank Mossberg Company, Attleboro, Mass., has issued a folder devoted to steel reels and metal spools. Catalogue No. 10, of the same company, describes wrenches, bells, reels, punches and dies, and special machinery.

ASBESTOS.—Asbestos in the form of sheet board, roll board, papers, building felts, etc., is described in a circular, No. 7235, recently issued by the H. W. Johns-Manville Company, 100 William Street, New York. Lead-joint runners made of asbestos are described in Circular No. 6875 of the same company.

DIRECT-CURRENT MOTORS.—Bulletin No. 60, of the Mechanical Appliance Company, Milwaukee, Wis., gives an excellent description of the constructive details of Watson motors and generators. Bulletin No. 61 contains 24 pages of illustrations showing various applications of Watson motors.

ALTERNATING-CURRENT GENERATORS for direct connection to steam engines are described in bulletin No. 74 of the Crocker-Wheeler Company, Ampere, N. J. Generators for use with gas engines are dealt with in bulletin No. 84, while belted alternators are treated in bulletin No. 77.

SUCTION GAS PLANTS.—R. D. Wood & Co., Philadelphia, Pa., have issued an illustrated catalogue giving much valuable data concerning the cost of converting the energy of coal into mechanical energy by means of suction gas producers. It is stated that a horse-power-hour can be obtained from one pound of coal.

TANTALUM LAMPS.—The Engineering Department of the National Electric Lamp Association has recently issued a new bulletin, having as its subject the tantalum lamp, as developed up to the present date. Sections are devoted to the performance of tantalum lamps on alternating current circuits and their use with Holophane reflectors.

WESTINGHOUSE STORAGE BATTERIES.—The Westinghouse Machine Company has issued a pamphlet on "Storage Batteries for Portable Service," in which a long line of such batteries is described, adapted for electric locomotives, car lighting, automobiles, railway signal work, etc. This line of storage batteries supplements the Westinghouse storage battery for stationary work which was placed on the market about two years ago.

STORAGE BATTERIES.—Two new booklets have recently been issued by the Electric Storage Battery Company, Philadelphia, "The Exide Instruction Book," of interest to users of electric vehicles, and "The Exide Sparking Battery Instruction Book," giving instructions and information applying to the 1908 model of the exide sparking battery for gasoline vehicles. These books will be forwarded upon application to any of the sales offices of the Electric Storage Battery Company.

PORCELAIN INSULATORS.—The Ohio Brass Company, Mansfield, Ohio, has issued a handsome, 64-page catalogue devoted entirely to porcelain insulators. This company has developed long lines of insulators for both low-tension and high-tension work, ranging from a pony insulator to line insulators for a voltage of 60,000. In addition, the catalogue describes types of wall insulators, high-tension porcelain tubes, porcelain circuit-breakers and various forms of steel insulator pins. An interesting section of the pamphlet is devoted to the subject of insulator tests, concerning which much information of practical value is given.

STANDARD SYMBOLS FOR WIRING PLANS.—The National Electric Contractors' Association of the United States and the American Institute of Architects have issued a chart of standard symbols showing various outlets, fixtures and other wiring devices. The General Electric Company, Schenectady, N. Y., has just issued a booklet containing sample plans of an office or accounting room, and of a kitchen and dining-room, in which the symbols are illustrated. The other pages of the brochure are used to illustrate and describe many of the G. E. specialties indicated by the symbols in the plans. Among these are key sockets, "Security Snap" pendant sockets, ceiling rosettes, cabinet panels, wireless clusters, snap switches, flush pocket wall receptacles, floor outlets, receptacles for heating devices, lamp receptacles, combined switch and cut-outs, etc. The booklet is being given a very wide circulation with the hope that it will aid in the general adoption of the standard symbols.

FORE RIVER SHIP BUILDING YARD.—The ship yard of the Fore River Ship Building Company, of Quincy, near Boston, Mass., although opened only a few years ago, has already become one of the most important plants on the Atlantic coast for the construction of large ships. It would be difficult to find one equipped more completely and embodying more of everything that is latest and best in engineering practice, as will be seen from a reading of Allis-Chalmers Company's bulletin No. 2034, which, besides containing illustrations of motor applications, gives a description of the various features of electrical equipment furnished by that company, one of the most interesting of which is the system for speed variations. The generator is operated on the two-wire plan, supplying the highest voltage, 240 volts, and on this voltage are operated all the constant speed motors, the crane motors and the lighting system of the yard. For variations of speed, this voltage is divided into three, by means of a balancing transformer, and by proper combinations a number of pressures may be obtained. The system is one in which the impressed electro-motive force upon the armature of a motor is changed to meet the requirements of speed regulation; or, in other words, change of speed is secured by increasing or diminishing the pressure and not by varying the resistance, as is more commonly practiced.

Business Notes.

GRAY & GROSH.—At Salt Lake City, Messrs. Owen M. Gray and Milton D. Grosh have organized a firm with the above title, for general engineering practice, making a specialty of mechanical, electrical and hydraulic work.

ROBBINS & MYERS.—The Robbins & Myers Company, of Springfield, Ohio, has just opened a store and salesroom in Chicago at 48 West Jackson Boulevard, the Atlantic Building, and will carry there a large stock of its well known fans and power motors.

THE ELECTRIC SERVICE SUPPLIES COMPANY has made a change in its St. Louis office, Mr. N. P. Hall temporarily succeeding Mr. Ernest Boehme, former manager of the St. Louis branch. A rearrangement of the personnel of the branch will be made early in the year.

B. S. BARNARD & COMPANY, 39-41 Cortlandt Street, New York City, manufacturers of electrical clay conduits for underground work, with factories throughout the West, have established an office in Chicago in the Monadnock Building. Mr. B. S. Barnard, who is still president of the Standard Vitrified Conduit Company, is also president of B. S. Barnard & Company, and will retain headquarters at their New York office, managing the sales of both. Mr. Barnard has been identified with the electrical field for the past 15 years, and is thoroughly conversant with the requirements of the trade in this line, having successfully executed some of the largest conduit contracts given out of late years. He is a member of the National Electric Light and National Telephone Associations, the Railway Club and several of the leading clubs in New York. Having factories throughout the West, in view of the large business to be done in this line next season, he has established a Western office, which will be in charge of Mr. E. F. Kirkpatrick, who occupies a position in the West similar to that held by Mr. Barnard in the East. Mr. Kirkpatrick was with the General Electric Company, Westinghouse and Fort Wayne Electric companies for some years and of late has been very active in the manufacture of clay conduits. Mr. Kirkpatrick is taken into the corporation as vice-president, managing the Chicago office. B. S. Barnard & Company's Western factories place their new office in a position to quote favorable prices, on account of the advantage in freight rates. The Electrical Show in Chicago, and the National Telephone Convention, will find on exhibition the product of B. S. Barnard & Company, which will be in charge of Messrs. Barnard and Kirkpatrick, jointly.

CHICAGO ELECTRICAL SHOW.—Twenty per cent more space for the Chicago Electrical Show than last year has already been sold and the number of exhibitors is greater. For music, John C. Weber's prize band of Cincinnati has been engaged, assisted by Miss Blanche Mehaffey, soprano soloist. The exhibit includes a nine-room house completely equipped by the Commonwealth Edison Company; the wireless telephone of the Radio Telephone Company; an electrical sign writer by Mr. L. I. Kahn; purifying water by the Ozone Company of America; special sanitation devices by the Thordarson Electric Manufacturing Company; a model of the Brennan gyroscopic car in operation; high voltage, high frequency experiments, and the typograph for transmitting typewriter letters and receiving them. The exhibitors are as follows: Alexander, F., Manufacturing Company; American Automatic Telephone Company; American Clock Company; American Electric Fuse Company; American Electric Novelty Company; American Electric Telephone Company; American Steel & Wire Company; American Telephone Journal; Anderson, A. & J., Manufacturing Company; Atlas Anchor Company; Automatic Electric Company; Automatic Igniter Company; Austin, H. B., & Company; Barnard, B. S., & Company; Benjamin Electric Manufacturing Company; Big "4" Manufacturing Company; Bristol Company; Buyers' Reference Company; Central Telephone & Electric Company; Central Electric Company; Century Telephone Construction Company; Chicago Lamp & Reflector Company; Chicago Telephone Supply Company; Chicago Fuse Wire & Manufacturing Company; Chicago Telephone Company; Chicago Pneumatic Tool Company; Commonwealth Edison Company; Cook, Frank B.; Couch, S. H., Company; Crane Company; Cullerton, John F., Company; Crescent Manufacturing Company; Dean Electric Company; Dixon, Jos., Crucible Company; Dossert & Company; Electric Appliance Company; Electrician Publishing Company; Electrical Review; Electric Storage Battery Company; Electrical World; Electrocraft Publishing Company; Einstein, A. O., Company; Federal Electric Company; Fort Wayne Electric Works; General Compressed Air & Vacuum Company; General Electric Company; International Correspondence Schools; International Telephone Manufacturing Company; Jewell Electric Instrument Company; Johns-Manville Company; Kellogg Switchboard Company; Lang, J., Electric Company; Lindstrom-Smith Company; Manhattan Electric Supply Company; Manufacturers' Record; Matthews, W. N., & Bro.; Moline Incandescent Lamp Company; Monarch Electric & Wire Company; Monarch Telephone Manufacturing Company; McDowell-Stocker Company; McRoy Clay Works; National Lamp Association; North Electric Company; North Shore Electric Company; Nungesser Electric Battery Company; Pardee, F. W.; Phoenix Glass Company; Public Service Publishing Company; Roebling, John A., Sons Company; Roth Bros. & Company; Shelton Electric Company; Solar Electric Company; Sterling Electric Company; Stoltz Electrophone; Stromberg-Carlson Telephone Manufacturing Company; Swedish-American Telephone Company; Swedish Electric Vibrator Company; Telephony Publishing Company; United Clock Company; Universal Manufacturing Company; Vivax Storage Battery Company; Vote-Berger Company; Wagner Electric Manufacturing Company; Western Electric Company.

Weekly Record of Electrical Patents.

UNITED STATES PATENTS, ISSUED DEC. 31, 1907.

[Conducted by Rosenbaum & Stockbridge, Pat. Attys., 41 Park Row, N. Y.]

874,941. ELECTRIC CLOCK; Ulysses L. Collins, St. Louis, Mo. App. filed March 13, 1907. Relates to an electric-operated winding mechanism for clocks. Includes a form of motor having an oscillating armature.

874,944. ART OF ELECTRIC SMELTING; Frank Creelman, New York, N. Y. App. filed Jan. 5, 1904. The production of calcium carbide by fusing the entire mixture in a zone of fusion produced by an electric arc maintained by a source of energy of substantially uniform amperage.

874,977. INCANDESCENT ELECTRIC LAMP; Charles L. R. E. Menges, The Hague, Netherlands. App. filed May 22, 1899. A process for producing incandescent conductors or filaments for electric lamps.

874,979. TROLLEY HARP; William J. Murphy, Bridgeport, Conn. App. filed July 20, 1904. The trolley wheel is pivoted between jaw members of the harp which are resiliently pressed together, whereby the bearing will automatically take up wear.

875,028. Train Stop for Electric Railways.

874,990. MULTIPLE VOLTAGE SYSTEM OF MOTOR CONTROL; William H. Powell, Norwood, Ohio. App. filed Oct. 19, 1905. Relates to controllers for electric motors, and particularly controllers adapted to vary the speed of a motor by changing the voltage applied thereto and operated from a multiple voltage system.

875,028. TRAIN-STOP FOR ELECTRIC RAILWAYS; Ernst Woltmann, New York, N. Y. App. filed Feb. 23, 1907. Relates to railway installations in which the power is supplied through a third rail constructed in insulated sections for train-stop and other purposes. Patentee provides connecting bonds for the separate sections whereby the third rail acts as a current-carrying conductor for the transmission of the power of the system. In this way separate copper cables are made unnecessary or greatly economized.

875,029. ELECTRIC SWITCH; James J. Wood, Fort Wayne, Ind. App. filed April 28, 1905. An electric switch adapted for use in a prepayment meter for cutting off the electric light when the meter makes its final counting down movement upon the measuring out of the amount of electric energy for which the customer has prepaid.

875,030. SWITCH FOR ELECTRIC METERS; James J. Wood, Fort Wayne, Ind. App. filed Sept. 19, 1905. Relates to modifications of the above.

875,035. ELECTRICAL IGNITING DEVICE FOR GAS STOVES; Vincent C. De Ybarrondo, Los Angeles, Cal. App. filed May 20, 1907. A form of spark plug particularly adapted to gas stoves for igniting the same.

875,040. AUTOMATIC LEAK INDICATOR FOR SHIPS; Charles Bergstrom, Tammerfors, Russia. App. filed July 5, 1907. Covers a float chamber having an electric contact device by means of which a leak in a ship is indicated.

875,057. RAILWAY TIE; Eli T. Forrester, Washington, D. C. App. filed June 29, 1907. Conduit construction for underground trolley roads; has a combined tie and yoke of composite or cushion form.

875,059. HYDRO-ELECTRIC MACHINE; Henry E. Fry, Dorchester, England. App. filed April 15, 1907. An apparatus for generating electricity directly by a steam jet on the principle of the frictional generation of electricity.

875,061. VENTILATION OF ELECTRIC RAILWAY MOTORS; George Gibbs, New York, N. Y. App. filed July 24, 1907. A complete pneumatic piping system extending co-axially through the pivots of the bogie trucks.

875,062. METHOD OF PRODUCING CAMPHOR FROM CAMPHENE, ISOBORNEOL OR OTHER CAMPHOR-PRODUCING SUBSTANCES; App. filed Jan. 26, 1906. The process of obtaining camphor which consists in suspending isoborneol in a solution of an alkali metal chlorid, passing an electric current through the mixture and separating the camphor.

875,063. SAFETY CAR SIGNALING DEVICE; George W. Goddard, Philadelphia, Pa. App. filed Jan. 15, 1907. Provides means for preventing the conductor from ringing the bell whenever there is anybody standing on the step or boarding or alighting from the car.

875,081. TELEPHONE-DICTATING SYSTEM OR APPARATUS; John W. Kelly, Jr., Camden, N. J. App. filed April 15, 1907. A dictating apparatus for business offices in which a single manager may dictate letters telephonically to any one of a corps of stenographers. Has a very sensitive transmitter and a loud ear-piece at the manager's station and the circuits arranged so as to be entirely separate in the respective directions. Only three wires are employed, however, between the manager's station and any stenographer's station.

875,091. ELECTRICAL ALARM DEVICE; Burnett Menkin, New Haven, Conn. App. filed July 18, 1905. An alarm device having means whereby the closing of one circuit will automatically effect the closing of a second circuit and cause the alarm device to be continuously actuated until the second circuit is manually broken.

875,105. ELECTROLYTIC RECEIVER; Fred C. Pickett, Kansas City, Mo. App. filed March 12, 1907. A receiver for electromagnetic waves having the receiving point with a split flattened end portion in an envelope of viscid material.

875,120. AUTOMATIC ELECTRIC BLOCK SIGNAL; William A. D. Short, Lexington, Ky. App. filed Nov. 25, 1905. Automatic block signals for systems of that type known as a spindle-operated electric-motor signal in which the controlling mechanism is located directly in line with the spindle shaft on top of the signal post.

875,138. TELEPHONE TRANSMITTER; Christian Umbrach, New York, N. Y. App. filed Feb. 8, 1907. In a telephone transmitter, a button provided with a movable electrode having a stud projecting

therefrom, a diaphragm, means for supporting said button and diaphragm, and means for securing said diaphragm to said stud, said means being self-adjusting to adapt itself to the angle at which the stud and diaphragm are assembled.

875,156. TELEPHONE TRANSMITTER; Henry P. Clausen, Chicago, Ill. App. filed Aug. 20, 1902. Renewed April 6, 1905. Has two diaphragms communicating by curved passages with a single mouthpiece.

875,178. ELECTRIC MOTOR; Dugald C. Jackson, Madison, Wis. App. filed Feb. 20, 1901. In an induction motive device, the combination with means for creating a single-phase alternating field, of an armature provided with electric circuits having different time constants subjected to said single-phase, alternating-current field, the said field inducing out of phase currents in said armature circuits, substantially as described.

875,179. ALTERNATING-CURRENT MOTOR; Dugald C. Jackson, Madison, Wis. App. filed April 1, 1901. Renewed March 17, 1904. The herein-described method of operating induction motors, which consists in creating a single-phase, alternating field, subjecting a revolubly mounted electric conducting circuits of relatively different reactance or resistance to the action of said field in its normal unmodified condition, substantially as described.

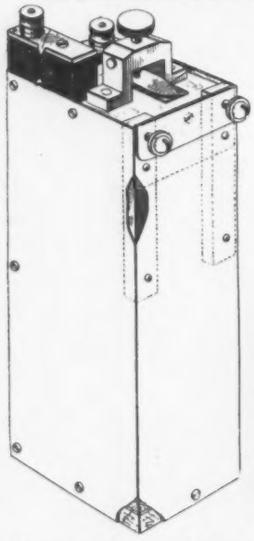
875,198. ELECTRIC BOND FOR RAILS; Frank M. Marcy, Worcester, Mass. App. filed May 3, 1906. Two conical blocks are connected by a bond compressed transversly thereinto by the force which hammers the blocks in place.

875,205. ELECTRIC REGULATION; Morris Moskowitz, New York, N. Y. App. filed Jan. 5, 1906. Relates to means for regulating electric circuits, particularly lamp circuits using a constant-current machine and a storage battery in multiple.

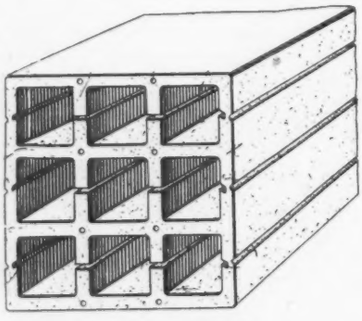
875,207. FIELD MAGNET; William D. Pomeroy, Norwood, Ohio. App. filed Oct. 30, 1903. Relates to dynamo electric machines of the revolving field type in which all the parts are held firmly in place and prevented from working loose in use.

875,208. PROCESS OF PRODUCING FERROVANADIUM; Edgar F. Price, Niagara Falls, N. Y. App. filed Dec. 29, 1906. Relates to the production of ferrovanadium low in silicon and containing a moderate percentage of carbon.

875,213. SECONDARY OR STORAGE BATTERY; Hugh Rodman and George M. Howard, Philadelphia, Pa. App. filed Dec. 22, 1905. The



875,472. Induction Coil and Box for Explosion Engines.



875,489. Conduit Tile.

active material for the negative plates consists of lead or an oxide of lead containing sulphate of barium precipitated from a cold solution.

875,215. TROLLEY POLE; Frederick M. Ross, Newport, Ky. App. filed March 4, 1907. A form of trolley retrieving device having latches which are tripped by a sudden abrupt movement of the pole.

875,238. COMPUTING METER; Warren E. Boyce, Pierce City, Mo. App. filed Oct. 3, 1906. Provides a meter which will compute and indicate the value of the energy consumed in dollars and cents, instead of in kw-hours.

875,259. METHOD OF EXTRACTING METALLIC ORES AND MATTE; Emil Gunther and Rudolf Franks, Eisleben, Germany. App. filed June 18, 1907. Relates particularly to the treatment of copper and nickel ores and to matte produced from such ores.

875,279. JUNCTION OR CONNECTING BOX; John A. McCoy, Somerville, Mass. App. filed March 19, 1906. Connection box at which a plurality of cables terminate and in which means are provided for interconnecting the conductors of the cables.

875,284. GRANULAR FURNACE; Henry N. Potter, New Rochelle, N. Y. App. filed May 14, 1904. An electric furnace consisting of a refractory heating resistance composed of free granules clamped between refractory electrodes, together with a refractory hollow body embedded within the said granular resistance.

875,285. METHOD OF MAKING SILICON; Henry N. Potter, New Rochelle, N. Y. App. filed June 10, 1905. The method of producing silicon by reducing silicon monoxide.

875,286. ART OF PRODUCING SILICON MONOXID; Henry N. Potter, New Rochelle, N. Y. App. filed June 14, 1905. The process of producing silicon monoxid which consists in causing an incomplete combustion of metallic silicon.

875,313. BLOCK SIGNAL APPARATUS; Alexander Bevan, Providence, R. I. App. filed April 18, 1907. Block signal system in which the signals are automatically operated by the passing cars to indicate the presence or absence of a car in the block, as well as the direction in which it may be moving.

875,331. FURNACE FOR DESULFURIZING AND AGGLOMERATING ORES; Andrew J. Dull, Harrisburg, and Joseph Weatherby, Jr., New Cumberland, Pa. App. filed Feb. 4, 1907. Construction of ore roasting furnace having a plurality of electrodes, one of which moves the agglomerated ore beyond the radius of action of the arc.

875,332. PROCESS OF DESULFURIZING AND AGGLOMERATING COMMINUTED ORES; Andrew J. Dull, Harrisburg, and Joseph Weatherby, Jr., New Cumberland, Pa. App. filed Feb. 4, 1907. Covers modifications of the above.

875,357. LAMP SOCKET; Walter R. Lambert, London, England. App. filed Feb. 1, 1907. Form of receptacle having a small spiral spring to constitute the central stud contact terminal.

875,376. HANDLE FOR ROTARY SNAP SWITCHES; Johann G. Peterson, Bridgeport, Conn. App. filed Nov. 21, 1905. Construction of handle or turn button for rotary snap switch.

875,394. ELECTRIC HEATER; August Voelker, Berlin, Germany. App. filed June 6, 1906. Form of resistance element having a cylindrical cartridge with a circuitous passage including refractory comminuted resistance material.

875,406. SWITCH; Christian N. Bergmann, Allegheny, Pa. App. filed May 4, 1905. Features of construction of a knife-blade switch by which the handle is securely attached to the blades.

875,410. PRINTING TELEGRAPH RECEIVER; John Burry, Ridgefield Park, N. J. App. filed Nov. 19, 1904. Relates to receiving or printing apparatus for type telegraph systems.

875,413. ELECTRIC SIGNALING; Dorabji M. Daboo, Bombay, India. App. filed July 17, 1905. Provides means whereby the controlling devices may all be electrically worked from one desired station to another, irrespective of distance.

875,454. AIR BRAKE; Edmund B. Powers, New York, N. Y. App. filed Feb. 26, 1907. Provides means whereby an engineer may test the entire length of a train pipe for obstructions, the result being indicated by a signal in the cab.

875,472. INDUCTION COIL AND BOX FOR EXPLOSION ENGINES; Richard Varley, Englewood, N. J. App. filed July 24, 1907. An induction coil unit for automobiles and other uses where induction coils are used in a series arranged side by side. In place of a wooden receiver, patentee makes use of a sheet-iron box open at one side to prevent choking the coil, and which effectively shields its action from the adjacent coils, thereby preventing cross induction.

875,489. CONDUIT-TILE; John Balch, Newark, N. J. App. filed Feb. 5, 1907. A conduit having grooved opposing walls and slotted interior division walls.

875,491. ALARM CIRCUIT; Joseph F. Bastel, St. Louis, Mo. App. filed June 28, 1906. A form of indicator to produce a signal in case the rails of a track are disturbed.

875,536. ELECTRIC CONTROLLER; Joseph Ledwinka, Philadelphia, Pa. App. filed Aug. 3, 1907. A means to permit the contemporaneous charging of the storage battery and operation of the vehicle motors by connection with the railway supply system when the current of such system is of such voltage as not to be directly applicable to charge said storage battery.

875,581. SYSTEM OF ELECTRIC MOTOR CONTROL; Henry D. James, Pittsburg, Pa. App. filed May 6, 1907. System of motor control in which the energy is supplied through sources of different voltages. Has means whereby a large range of speeds can be secured.

875,582. MULTIVOLTAGE SYSTEM OF ELECTRIC MOTOR CONTROL; Henry D. James, Pittsburg, Pa. App. filed May 6, 1907. Relates to modifications of the above.

875,583. METHOD OF CONTROL OF ELECTRIC MOTORS; Henry D. James, Pittsburg, Pa. App. filed May 6, 1907. Covers additional modifications.

875,584. MULTIPLE VOLTAGE SYSTEM OF CONTROL; Henry D. James, Pittsburg, Pa. App. filed May 6, 1907. Modifications of No. 875,581.

875,596. TROLLEY POLE RETRIEVER; Luther M. Perkins, Tacoma, Wash. App. filed May 6, 1907. A pneumatically operated retriever having a valve which opens to admit air to the retrieving cylinder in case the trolley wheel leaves the wire.

875,632. METHOD FOR DETINNING AND PRODUCING TIN COMPOUNDS AND OTHER PRODUCTS; Elmer A. Sperry, Brooklyn, N. Y. App. filed Aug. 24, 1907. The process of anhydrous detinning which consists in subjecting compacted scrap to the action of chlorinated anhydrous liquid and feeding dilute heated chlorin to the mass.

875,641. APPARATUS FOR REFINING COPPER; Frank L. Antisell, New York, N. Y. App. filed July 5, 1906. Relates to apparatus for electrolytic refining of copper where an impure copper anode is suspended in an electrolyte and deposited in an approximately pure state by an electric current.

875,643. PRINTING TELEGRAPH; John C. Barclay, New York, N. Y. App. filed April 22, 1905 Details of circuits and mechanical construction.

875,660. PRINTING TELEGRAPH; Frederick J. Haig, Hyattsville, Md. App. filed Aug. 30, 1906. Construction of printing telegraph in which the transmitter closely resembles in structure and in operation the usual commercial typewriting machine.

875,663. SYSTEM OF CONTROL; Henry D. James, Pittsburg, Pa. App. filed May 6, 1907. Provides an arrangement of the circuits of the motor control system by which the proper voltages may be applied to the operating or controlling magnet windings of the separately actuated switches of the control system.

875,668. PROCESS OF PRODUCING AN ALLOY FOR USE IN STEEL-CASTING; Maurice Meslans, Paris, France. App. filed July 7, 1902. An alloy of aluminum and calcium containing more than 8.6 per cent calcium.

875,672. METHOD OF MAKING SILICON; Henry N. Potter, New Rochelle, N. Y. App. filed June 10, 1905. The method of producing silicon which consists in reducing silicon monoxid by heating it with silicon carbide.

875,673. METHOD OF MAKING SILICON CARBID; Henry N. Potter, New Rochelle, N. Y. App. filed June 10, 1905. The method of producing silicon carbid by heating together one equivalent of silicon monoxid and two equivalents of carbon.

875,674. METHOD OF MAKING SILICON DIOXID; Henry N. Potter, New Rochelle, N. Y. App. filed June 10, 1905. The method of producing comminuted silicon dioxid which consists in oxidizing silicon monoxid.

875,675. METHOD OF PRODUCING SILICON MONOXID; Henry N. Potter, New Rochelle, N. Y. App. filed June 10, 1905. The method of producing silicon monoxid which consists in reducing silica by means of silicon.

875,676. METHOD OF PREPARING SILICON-MONOXID POWDER; Henry N. Potter, New Rochelle, N. Y. App. filed June 10, 1905. The method of producing silicon-monoxid powder which consists in distilling vitreous silicon monoxid.